



DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R9–ES–2012–0039]

[4500030115]

Endangered and Threatened Wildlife and Plants; Listing the Scarlet Macaw

RIN 1018–AY39

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule; 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service, propose to list as endangered the northern subspecies of scarlet macaw (*Ara macao cyanoptera*) and the northern distinct vertebrate population segment (DPS) of the southern subspecies (*A. m. macao*) as endangered

under the Endangered Species Act of 1973, as amended (Act). We are taking this action in response to a petition to list this species as endangered or threatened under the Act. This document, which also serves as the completion of the status review and as the 12-month finding on the petition, announces our finding that listing is warranted for the northern subspecies and northern DPS of the southern subspecies of scarlet macaw. If we finalize this rule as proposed, it would extend the Act's protections to this subspecies and DPS. We seek information from the public on this proposed rule and status review for this subspecies and DPS.

DATES: We will consider comments and information received or postmarked on or before [Insert date 60 days after date of publication in the **Federal Register**].

ADDRESSES: You may submit comments by one of the following methods:

(1) Electronically: Go to the Federal eRulemaking Portal: <http://www.regulations.gov>. Search for FWS–R9–ES–2012–0039, which is the docket number for this rulemaking. On the search results page, under the Comment Period heading in the menu on the left side of your screen, check the box next to "Open" to locate this document. Please ensure you have found the correct document before submitting your comments. If your comments will fit in the provided comment box, please use this feature of <http://www.regulations.gov>, as it is most compatible with our comment review procedures. If you attach your comments as a separate document, our preferred file format is Microsoft Word. If you attach multiple comments (such as form letters), our preferred format is a spreadsheet in Microsoft Excel.

(2) By hard copy: Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R9–ES–2012–0039; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

We will not accept comments by e-mail or fax. We will post all comments on <http://www.regulations.gov>. This generally means that we will post any personal information you provide us (see the **Information Requested** section below for more information).

FOR FURTHER INFORMATION CONTACT: Janine Van Norman, Chief, Branch of Foreign Species, Endangered Species Program, U.S. Fish and Wildlife Service, 4401 North Fairfax Drive, Room 420, Arlington, VA 22203; telephone 703-358-2171. If you use a telecommunications device for the deaf (TDD), call the Federal Information Relay Service (FIRS) at 800-877-8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

I. Purpose of the Regulatory Action

We were petitioned to list the scarlet macaw, and 13 other parrot species, under the Endangered Species Act of 1973, as amended (Act). During our status review, we found that threats do not place the species at risk of extinction throughout all of its range, but do so

throughout all the range of the subspecies *A. m. cyanoptera* and all the range of the northern DPS of *A. m. macao*. Therefore, in this 12-month finding, we announce that listing the subspecies *A. m. cyanoptera* and the northern DPS of *A. m. macao* is warranted, and are proposing to list these entities as endangered under the Act. We are undertaking this action pursuant to a settlement agreement and publication of this action will fulfill our obligations under that agreement.

II. Major Provision of the Regulatory Action

This action is authorized by the Act. It affects Part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations. If adopted as proposed, this action would extend the protections of the Act to the subspecies *A. m. cyanoptera* and the northern DPS of *A. m. macao*.

Background

Section 4(b)(3)(B) of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 *et seq.*) requires that, for any petition to revise the Federal Lists of Endangered and Threatened Wildlife and Plants that contains substantial scientific or commercial information that listing the species may be warranted, we make a finding within 12 months of the date of receipt of the petition (“12-month finding”). In this finding, we determine whether the petitioned action is: (a) Not warranted, (b) warranted, or (c) warranted, but immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are endangered or threatened, and expeditious progress is being made

to add or remove qualified species from the Federal Lists of Endangered and Threatened Wildlife and Plants. We must publish these 12-month findings in the **Federal Register**.

In this document, we announce that listing the subspecies *A. m. cyanoptera* and the northern DPS of the subspecies *A. m. macao* as endangered is warranted, and we are proposing to add these entities, as endangered, to the Federal List of Endangered and Threatened Wildlife. We also find that listing the southern DPS of the subspecies *A. m. macao* under the Act is not warranted.

Prior to issuing a final rule on this proposed action, we will take into consideration all comments and any additional information we receive. Such information may lead to a final rule that differs from this proposal. All comments and recommendations, including names and addresses of commenters, will become part of the administrative record.

Previous Federal Actions

Petition History

On January 31, 2008, the Service received a petition dated January 29, 2008, from Friends of Animals, as represented by the Environmental Law Clinic, University of Denver, Sturm College of Law, requesting that we list 14 parrot species under the Act. The petition clearly identified itself as a petition and included the requisite information required in the Code of Federal Regulations (50 CFR 424.14(a)). On July 14, 2009 (74 FR 33957), we published a

90-day finding in which we determined that the petition presented substantial scientific and commercial information to indicate that listing may be warranted for 12 of the 14 parrot species. In our 90-day finding on this petition, we announced the initiation of a status review to list as endangered or threatened under the Act, the following 12 parrot species: blue-headed macaw (*Primolius couloni*), crimson shining parrot (*Prosopeia splendens*), great green macaw (*Ara ambiguus*), grey-cheeked parakeet (*Brotogeris pyrrhoptera*), hyacinth macaw (*Anodorhynchus hyacinthinus*), military macaw (*Ara militaris*), Philippine cockatoo (*Cacatua haematuropygia*), red-crowned parrot (*Amazona viridigenalis*), scarlet macaw (*Ara macao*), white cockatoo (*Cacatua alba*), yellow-billed parrot (*Amazona collaria*), and yellow-crested cockatoo (*Cacatua sulphurea*). We initiated this status review to determine if listing each of the 12 species is warranted, and initiated a 60-day information collection period to allow all interested parties an opportunity to provide information on the status of these 12 species of parrots. The public comment period closed on September 14, 2009.

On October 24, 2009, and December 2, 2009, the Service received a 60-day notice of intent to sue from Friends of Animals and WildEarth Guardians, for failure to issue 12-month findings on the petition. On March 2, 2010, Friends of Animals and WildEarth Guardians filed suit against the Service for failure to make timely 12-month findings within the statutory deadline of the Act on the petition to list the 14 species (*Friends of Animals, et al. v. Salazar*, Case No. 10 CV 00357 D.D.C.).

On July 21, 2010, a settlement agreement was approved by the Court (CV-10-357, D. D.C.), in which the Service agreed to submit to the **Federal Register** by July 29, 2011,

September 30, 2011, and November 30, 2011, determinations whether the petitioned action is warranted, not warranted, or warranted but precluded by other listing actions for no less than 4 of the petitioned species on each date. On August 9, 2011, the Service published in the **Federal Register** a proposed rule and 12-month status review finding for the following four parrot species: crimson shining parrot, Philippine cockatoo, white cockatoo, and yellow-crested cockatoo (76 FR 49202). On October 6, 2011, we published a 12-month status review finding for the red-crowned parrot (76 FR 62016). On October 11, 2011, we published a proposed rule and 12-month status review finding for the yellow-billed parrot (76 FR 62740), and on October 12, 2011, we published a 12-month status review for the blue-headed macaw and grey-cheeked parakeet (76 FR 63480).

On September 16, 2011, an extension for completing the 12-month findings with respect to the remaining four petitioned species was approved by the Court (CV-10-357, D. D.C.), in which the Service agreed to submit these determinations to the **Federal Register** by June 30, 2012.

In completing this status review, we make a determination whether the petitioned action is warranted, not warranted, or warranted but precluded by other listing actions for one of the remaining species that is the subject of the above-mentioned settlement agreement, the scarlet macaw. This **Federal Register** document complies, in part, with the last deadline in the court-ordered settlement agreement.

Information Requested

We intend that any final actions resulting from this proposed rule will be based on the best scientific and commercial data available. Therefore, we request comments or information from other concerned governmental agencies, the scientific community, or any other interested parties concerning this proposed rule. We particularly seek clarifying information concerning:

- (1) Information on taxonomy, distribution, habitat selection and trends, diet, and population abundance and trends (Venezuela, northwest Columbia and other areas of Columbia outside the Amazon Biome) of this species.
- (2) Information on the species historical and current status in Trinidad and Tobago.
- (3) Information on the effects of habitat loss and changing land uses on the distribution and abundance of this species.
- (4) Information on the effects of other potential threat factors, including live capture and hunting, domestic and international trade, predation by other animals, and any diseases that are known to affect this species or its principal food sources.
- (5) Information on management programs for parrot conservation, including mitigation measures related to conservation programs, and any other private, nongovernmental, or governmental conservation programs that benefit this species.
- (6) The potential effects of climate change on this species and its habitat.

In addition, for law enforcement purposes, we are considering listing scarlet macaw intraspecific crosses, and individuals of the southern DPS of *A. m. macao*, based on similarity of appearance to entities proposed for listing in this document. Therefore, we also request information from the public on the similarity of appearance of scarlet macaw intraspecific

(within species) crosses, and individuals of the southern DPS of *A. m. macao*, to the entities proposed for listing in this document.

Please include sufficient information with your submission (such as full references) to allow us to verify any scientific or commercial information you include. Submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination. Section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or threatened species must be made “solely on the basis of the best scientific and commercial data available.”

Public Hearing

At this time, we do not have a public hearing scheduled for this proposed rule. The main purpose of most public hearings is to obtain public testimony or comment. In most cases, it is sufficient to submit comments through the Federal eRulemaking Portal, described above in the **ADDRESSES** section. If you would like to request a public hearing for this proposed rule, you must submit your request, in writing, to the person listed in the **FOR FURTHER INFORMATION CONTACT** section by [Insert date 45 days after date of publication in the Federal Register].

Species Information and Factors Affecting the Species

Section 4 of the Act (16 U.S.C. 1533) and implementing regulations (50 CFR part 424) set forth procedures for adding species to, removing species from, or reclassifying species on the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, a species may be determined to be endangered or threatened based on any of the following five factors:

- (A) The present or threatened destruction, modification, or curtailment of its habitat or range;
- (B) Overutilization for commercial, recreational, scientific, or educational purposes;
- (C) Disease or predation;
- (D) The inadequacy of existing regulatory mechanisms; or
- (E) Other natural or manmade factors affecting its continued existence.

In considering whether a species may warrant listing under any of the five factors, we look beyond the species' exposure to a potential threat or aggregation of threats under any of the factors, and evaluate whether the species responds to those potential threats in a way that causes actual impact to the species. The identification of threats that might impact a species negatively may not be sufficient to compel a finding that the species warrants listing. The information must include evidence indicating that the threats are operative and, either singly or in aggregation, affect the status of the species. Threats are significant if they drive, or contribute to, the risk of extinction of the species, such that the species warrants listing as endangered or threatened, as those terms are defined in the Act.

Biological Information

Species Description

The scarlet macaw (*Ara macao*) is one of several large neotropical parrot species commonly referred to as macaws. Scarlet macaws are among the larger of the macaws, measuring 84–89 centimeters (33–35 inches) in length and weighing 900–1490 g (2.0–3.3 pounds) (Collar 1997, p. 421). They are brilliantly colored and predominantly scarlet red. Most of the head, body, tail, and underside of the wings are red. Color on the upper side of the wing appears generally as bands of red, yellow, and blue, with varying amounts of green occurring between the yellow and blue band. Lower back, rump, and tail coverts (upper tail feathers) are blue. The species has large white, mostly bare facial patches on either side of its bill. The upper bill is a light, whitish color, whereas the lower bill is black. The sexes are similar, and immature birds are similar to adults, except that immature birds have shorter tails (Collar 1997, p. 421; Wiedenfeld 1994, p. 100; Forshaw 1989, pp. 404, 406).

Taxonomy

The scarlet macaw was first described in 1758 by Linnaeus (Collar 1997, p. 421; Wiedenfeld 1994, p. 99). Wiedenfeld (1994, entire) later described the subspecies *A. macao cyanoptera*, separating it from the nominate form, *A. macao macao*. He based this separation on results of a study in which he examined the morphology of 31 museum specimens of wild birds from known locations throughout the range of the species, which extends from Mexico southward through Central America and northern South America. He describes *A. m. cyanoptera* as differing from *A. m. macao* in size and wing color. *A. m. cyanoptera* is larger than *A. m. macao*, with significantly longer wing lengths. The yellow wing coverts that are tipped in blue have no green band separating the yellow and blue as in *A. m. macao*. Wiedenfeld (1994, p.

100–101) describes *A. m. cyanoptera* as historically occurring from southern Mexico south to central Nicaragua. He describes birds from southern Nicaragua to northern Costa Rica as representing a zone of intergradation between the two forms, and the nominate form occurring from this zone southward to, and through, the South American range of the species.

The subspecies classification described by Wiedenfeld (1994, entire) is broadly used in the scientific community and the subspecies are recognized by the Integrated Taxonomic Information System (ITIS) as valid taxa (ITIS 2011, unpaginated). Further, preliminary results of recent genetic research on mitochondrial DNA of the species support Wiedenfeld's subspecies classification (Schmidt 2011, pers. comm.; Schmidt & Amato 2008, pp. 135–137). According to Schmidt and Amato (2008, p. 137), the data indicate two distinct clusters of haplogroups (groups that carry certain genetic markers potentially used to connect distant ancestry with a particular geographical region), suggesting two distinct taxonomic units, with the boundary between the clusters consistent with the southern Nicaragua and northern Costa Rica zone of intergradation described by Wiedenfeld. According to Schmidt (2011, pers. comm.), the data also show genetic differentiation between *A. m. macao* that occur on either side of the Andes, indicating two populations: one consisting of birds west of the Andes in Costa Rica, Panama, and northwest Columbia, and one consisting of birds east of the Andes in the species' South American range.

Because recent genetic research supports Wiedenfeld's subspecies classification for scarlet macaw, and because this classification is broadly accepted in the scientific community and used in the scientific literature, we consider the subspecies *A. m. macao* and *A. m. cyanoptera* as valid taxa.

Range

The range of the scarlet macaw is the broadest of all the macaw species (Ridgely 1981, p. 250). Extending from Mexico southward to central Bolivia and Brazil, it covers an estimated 6,710,000–7,030,975 square kilometers (km²) (2,590,745–2,714,675 square miles (mi²)) (BirdLife International (BLI) 2012, unpaginated; Vale 2007, p. 112). The majority (83 percent) of the species' current range lies within the Amazon Biome of South America (BLI 2011a, unpaginated; BLI 2011b, unpaginated; BLI 2011c, unpaginated).

Historically, the range of the scarlet macaw included the southern portion of the Mexico state of Tamaulipas southward through the states of Veracruz, Oaxaca, Tabasco, Chiapas, and Campeche; all of Belize; the Pacific and Atlantic slopes of Guatemala, Honduras, Nicaragua, El Salvador, and Costa Rica; the Pacific slope of Panama; the Magdalena Valley in Columbia; and northern South America east of the Andes in Columbia, Ecuador, Peru, Venezuela, Suriname, Guyana, French Guiana, and Bolivia and Brazil as far south as Santa Cruz and northern Mato Grosso, respectively (Wiedenfeld 1994, pp. 100–101; Forshaw 1989, p. 406; Ridgely 1981, p. 250). Some authors report the native range of the species to include Trinidad and Tobago (BLI 2011d, unpaginated; Forshaw 1989, p. 406). However, the historical record consists of only two questionable site records of the species in Trinidad and Tobago (Forshaw 1989, p. 407; French 1973, p. 76). Forshaw (1989, p. 407) suggests the species may occur in that country as a very occasional vagrant or an escapee from captivity.

Although the scarlet macaw still occurs over much of its range in South America (see *Distribution and Abundance*), its range in Mesoamerica (Mexico and Central America) has been reduced and fragmented over the past several decades as a result of habitat destruction and harvesting of the species for the pet trade (Vaughan *et al.* 2003, pp. 2–3; Collar 1997, p. 421;

Wiedenfeld 1994, p. 101; Snyder *et al.* 2000, p. 150). The species has been extirpated from almost all of its former range in Mexico, all of its former range in El Salvador, and much of its former range in the rest of Central America. The species now occurs primarily in the Maya Forest region of eastern Chiapas (Mexico), northern Guatemala, and southwest Belize; in the Mosquitia region of eastern Honduras and eastern Nicaragua; in west-central Costa Rica's Carara National Park and surrounding area; in southwest Costa Rica's OSA Peninsula and surrounding area; and on Coiba Island in Panama. In addition to these populations, small groups or remnant populations of 10 to 50 individuals also occur in a few areas in the region (see ***Distribution and Abundance***).

Habitat

The scarlet macaw occurs in lowland tropical forests and savanna, often near rivers (Juniper and Parr 1998, p. 425; Collar 1997, p. 421; Wiedenfeld 1994, p. 101). The species inhabits primarily tropical humid evergreen forest, but also other forest types, including riparian or gallery forest, and, in Central America, tropical deciduous forest, mixed pine and broadleaf woodland, and pine savanna (Inigo-Elias 2010, unpaginated; Collar 1997, p. 421; Wiedenfeld 1994, p. 101). In one location, it is reported to roost and nest in mangrove forest (Vaughan *et al.* 2005, p. 127). The species generally occurs from sea level to about 500 meters (m) elevation, but has been reported ranging up to 1,500 m in Central America (Juniper and Parr 1998, p. 425; Vaughan 1983, in Vaughan *et al.* 2006, p. 919).

The scarlet macaw is considered somewhat tolerant of degraded or fragmented habitat (BLI 2011c, unpaginated; Forshaw 1989, p. 406). If not hunted or captured for the pet trade, they can survive in human-modified landscapes provided sufficient large trees remain for nesting and feeding requirements (BLI 2011c, unpaginated; Forshaw 1989, p. 406; Ridgely 1981, p. 251). They are reported occurring in landscapes that include a combination of agricultural land, pastureland, timber harvesting areas, and remnant forest patches (Vaughn *et al.* 2006, p. 920; Vaughan *et al.* 2005, p. 120; Vaughan *et al.* 2003, p. 7); partially cleared forest where large trees have been left standing (Forshaw 89, p. 407); pastureland with scattered woodlots or remnant patches of rainforest (Vaughn *et al.* 2009, p. 396; Forshaw 89, p. 407); and areas of human settlement (towns) (Guittar *et al.* 2009, p. 390). Several studies, however, indicate the species occurs in disturbed or secondary (recovering) forest habitat at lower densities than in primary (undisturbed) forest (Cowen 2009, pp. 11–15; Karubian *et al.* 2005, pp. 622–623; Lloyd 2004, pp. 269, 272).

Movements

Scarlet macaws appear to be nomadic to varying degrees (Boyd and Brightsmith 2011, *in litt.*; Collar 1997, p. 324). In some areas, scarlet macaw movements appear to be seasonal (Karubian *et al.* 2005, p. 624; Renton 2002, p. 17). Because scarlet macaws feed primarily in the canopy on seeds (see ***Diet and Foraging***), they are linked to the fruiting patterns of canopy trees. Results of several studies suggest that fluctuations in abundance of these food sources may result in movements of macaws to areas with greater food availability (Haugaasen and Peres 2007, pp. 4174, 4179–4180; Moegenburg and Levey 2003, entire; Renton 2002, pp. 17–18). Parrots

species can travel tens to hundreds of kilometers (km) (10 km = 6.2 miles (mi); 100 km = 62.1 mi) and are consequently able to exploit resources in a variety of habitats within the larger landscape (Lee 2010, p. 7–8, citing several authors; Brightsmith 2006, unpaginated; Collar 1997, p. 241). Recently, radio telemetry studies have been conducted on scarlet macaws in Guatemala, Belize, and Peru (Boyd and Brightsmith 2011, *in litt.*; Boyd 2011, pers. comm.). Preliminary results show great variation in the distances over which scarlet macaws range, but suggest home ranges of individuals cover hundreds of km² (100 km² = 38.6 mi²). Of nine scarlet macaws tracked over periods of 3 to 9 months, the maximum extent of an individual's range (farthest distance between two points at which individuals were located with radio telemetry) varied from approximately 25 km (15.5 mi) to approximately 165 km (102.5 mi), with most between 25 km (15.5 mi) and 50 km (31.1 mi) (Boyd and Brightsmith 2011, *in litt.*; Boyd 2011, pers. comm.).

In addition to larger scale movements, scarlet macaws also undergo smaller scale movements between nocturnal roost sites and daily foraging areas. Conspicuous morning and evening flights to and from regularly used roost sites have been documented in several locations within the species' range (Marineros and Vaughan 1995, pp. 448–450; Forshaw 1989, p. 407).

Diet and Foraging

Scarlet macaws forage primarily in the forest canopy. They are relatively general in their feeding habits, with studies reporting as many as 52 plant species, from at least 21 plant families, consumed, including nonnative and cultivated species in some areas. The majority of plants consumed by scarlet macaws are tree species, but these plants also include bromeliads, orchids,

and lichen. Seeds comprise the majority of their diet, but they also consume various quantities of fruit pulp, flowers, leaves, and bark (Dear *et al.* 2010, pp. 14–15; Lee 2010, pp. 153–160; Matuzak *et al.* 2008, p. 355; Renton 2006, p. 281; Vaughan *et al.* 2006, pp. 920, 924; Gilardi 1996 in Matuzak 2008, p. 361; Marineros and Vaughan 1995, pp. 451–452; Nycander *et al.* 1995, p. 424). In some areas scarlet macaws regularly visit clay banks where they consume soil or minerals, although it is unclear whether this provides a nutritional or other benefit to the species (Brightsmith *et al.* 2010, entire; Brightsmith 2004, pp. 136–137; Brightsmith and Munoz-Najar 2004, entire).

Fluctuations in the abundance and availability of scarlet macaw food sources may result in movements to areas with greater food availability, influencing local seasonal patterns of bird abundance (see ***Movements***), or resulting in a change in diet (Lee 2010, p. 7; Cowen 2009, pp. 5, 23, citing several sources; Tobias and Brightsmith 2007, p. 132; Brightsmith 2006, unpaginated; Renton 2002, p. 17).

Social Behavior

The scarlet macaw is believed to be similar to most parrots in being monogamous and generally mating for life (Collar 1997, pp. 296, 311). As with most parrots, the scarlet macaw lives year-round in pairs (Collar 1997, p. 296; Inigo-Elias 1996, p. 77). The species is also often observed flying in small flocks of 3 or 4 that include a pair and their young of the year, or in larger flocks of 20 to 30 individuals (Vaughan *et al.* 2005, p. 120; Juniper and Parr 1998, p. 425; Marineros and Vaughan 1995, p. 448; Forshaw 1989, pp. 406–407). Up to 50 individuals may

congregate at nocturnal roost sites (Juniper and Parr 1998, p. 425), although one roost site with several hundred individuals is reported in Costa Rica (Marineros and Vaughan 1995, p. 455).

Reproduction

Nest Sites

Scarlet macaws nest high above the ground in pre-existing tree cavities. The average height of scarlet macaw nest cavities ranges from 16 meters (m) (52.5 feet (ft)) to 24 m (78.7 ft) above the ground (Guittar *et al.* 2009; Anleu *et al.* 2005; Inigo-Elias 1996, p. 59; Marineros and Vaughn 1995, p. 455). Scarlet macaws are relatively flexible with respect to selection of nest cavities (Guittar *et al.* 2009, p. 391; Renton and Brightsmith 2009, pp. 3–6; Inigo-Elias 1996, pp. 92–93). They nest in a variety of tree species, including *Ceiba pentandra*, *Schizolobium parahybum*, *Vatairea lundellii*, *Caryocar costaricense*, *Acacia glomerosa*, *Dipteryx micrantha*, *Iriartea deltoidea*, *Erythrina* trees, and others, and nest in both live and dead trees (Guittar *et al.* 2009, pp. 389–399; Renton and Brightsmith 2009, pp. 3–4; Brightsmith 2005, p. 297; Vaughan *et al.* 2003, p. 8; Inigo-Elias 1996, p. 57; Marineros and Vaughan 1995, p. 456; Nycander *et al.* 1995, p. 431). The species also will nest in previously used cavities (Renton and Brightsmith 2009, p. 4–5; Nycander *et al.* 1995, p. 428), and will readily investigate and often nest in artificial (human-made) cavities when supplied (Brightsmith 2005, p. 297; Vaughan *et al.* 2003, p. 10; Nycander *et al.* 1995, pp. 435–436). Inigo-Elias (1996, p. 57) found that tree species used most often in the Usumacinta drainage area of southeast Mexico were used in proportion to their occurrence in the area studied.

Due to the scarlet macaw's large size, the species requires large nest cavities, which are usually found in older, larger trees. Tree cavities large enough for macaws to nest in are scarce, and the availability of suitable nest sites may limit scarlet macaw reproduction (Vaughan *et al.* 2003, pp. 10–12; Inigo-Elias 1996, p. 92; Nycander *et al.* 1995, p. 428; Munn 1992, pp. 55–56). Intense competition for nest cavities in some areas suggests suitable cavities may be limited in these areas. Scarlet macaws are frequently observed competing for nest cavities with other macaws, including other species and other scarlet macaw pairs (Renton and Brightsmith 2009, p. 5; Vaughan *et al.* 2003, p. 10; Inigo-Elias 1996, pp. 79, 96; Nycander 1995, p. 428). Scarlet macaws are also sometimes displaced from nest cavities by Africanized honeybees (see ***Factor E***).

Several factors may contribute to the suitability of nest cavities. For instance, in addition to size requirements, scarlet macaws appear to select nest cavities in trees that are isolated from surrounding vegetation, possibly to protect from non-volant (unable to fly) predators (Brightsmith 2005, p. 302; Inigo-Elias 1996, p. 93).

Breeding

Large macaws are long-lived species that mature slowly and have small clutch sizes, have generally only one clutch per year, have low survival of nestlings and fledglings, have a late age of first reproduction, have a large proportion of nonbreeding adults, and have restrictive nesting requirements (Wright *et al.* 2001, p. 711; Collar 1997, pp. 296, 298; Munn 1992, pp. 53–56). Consequently, they have low rates of reproduction and are, therefore, particularly vulnerable to

extinction through factors that increase their rates of mortality (Owens and Bennett 2000, p. 12146; Bennett and Owens 1997, entire).

The scarlet macaw begins breeding at 4 to 7 years of age (Clum 2008, p. 65; Brightsmith *et al.* 2005, p. 468), and the maximum breeding age is roughly estimated to be 25 years (Clum 2008, p. 65). In general, the proportion of breeding birds in a population of parrots in any given year is low (Collar 1997, p. 320). Research on three species of large macaws, including scarlet macaws, at a location free of anthropogenic disturbance suggests that only 10 to 20 percent of adult mated pairs attempt to nest in any given year (Munn 1992, pp. 47, 53–54). Scarlet macaws lay from 1 to 4 eggs (Garcia *et al.* 2008, p. 101; Collar 1997, p. 421; Inigo-Elias 1996, p. 80; Nycander *et al.* 1995, p. 430). Eggs are incubated for approximately 22–34 days, and chicks fledge at 65 to 100 days of age (Vigo *et al.* 2011, p. 147; Garcia *et al.* 2008, p. 101; Vaughan *et al.* 2003, p. 6; Collar 1997, p. 421; Inigo Elias 1996, pp. 81–82). Parental care is reported to last at least 77 days (Myers and Vaughan 2004, p. 415). The breeding season varies with location but generally occurs between October and June (Brightsmith 2005, pp. 297–299; Vaughan *et al.* 2003, p. 6; Collar 1997, p. 421; Inigo-Elias 1996, p. 87; Forshaw 1989, p. 408).

The results of several studies indicate that approximately one-third to one-half of nests fail each year (Renton and Brightsmith 2009, pp. 4–5; Garcia *et al.* 2008, p. 51; Nycander *et al.* 1995, pp. 431–432; Munn 1992, p. 54). Successful nests usually fledge only one or two young, with most (67 to 89 percent) fledging only one (Renton and Brightsmith 2009, p. 4; Clum 2008, pp. 65–66; Nycander *et al.* 1995, p. 434; Munn 1992, p. 54). Nesting successes of 0.48 to 0.89 fledglings per nest have been reported (Renton and Brightsmith 2009, pp. 4–5; Boyd and McNab 2008, p. 61; Nycander *et al.* 1995, pp. 431, 434; Munn 1992, p. 54). Several factors contribute to nest mortality, including starvation of chicks, predation of eggs or chicks, and competition for

nest cavities during which eggs are crushed or chicks are killed (Renton and Brightsmith 2009, p. 5; Garcia *et al.* 2008, p. 52; Inigo-Elias 1996, p. 83; Nycander *et al.* 1995, pp. 431–434).

Distribution and Abundance

The range-wide population of the species is estimated to be approximately 20,000–50,000 (BLI 2011a, unpaginated). BLI (2011a, unpaginated) reports the global population is suspected of being in decline due to ongoing habitat destruction and overexploitation of the species. However, they believe the decline will result in less than a 30 percent decrease in the population over 10 years or three generations. A decline in the species is particularly evident in Mesoamerica, where it was formerly considered widespread but now occurs primarily in small, isolated populations where large tracts of forest remain (Wiedenfeld 1994, p. 102; Forshaw 1989, p. 406). Using 1992 estimates from Honduras, Wiedenfeld estimated the total number of scarlet macaws in Mesoamerica to be approximately 5,000 birds, consisting of 4,000 *A. m. cyanoptera* (occurring from southern Mexico to Nicaragua), and 1,000 *A. m. macao* (occurring in Costa Rica and Panama). More recently, McNab (2009, unpaginated) suggests the current population of *A. m. cyanoptera* is fewer than 1,000 birds.

Maya Forest (Mexico, Guatemala, and Belize)

Described as previously abundant in Mexico (Comisión Nacional Para el Conocimiento y Uso de la Biodiversidad (CONABIO) 2011, p. 2) and numbering in the many thousands (Patten *et al.* 2010, p. 30), the scarlet macaw is now reported to occur in only two small, isolated populations in Mexico. One population occurs in the upper Rio Uxpanapa region near San Francisco La Paz in Oaxaca (Inigo-Elias 1996, pp. 16–17). Citing several sources, Inigo-Elias

(2010, unpaginated) and McReynolds (2011, *in litt.*) indicate that the upper Uxpanapa River population consists of possibly 50 scarlet macaws. According to Townsend Peterson *et al.* (2003, p. 232), it is possible that the species may occur seasonally in this area. The second population occurs in the southern Mexico and Guatemala border area of eastern Chiapas, and is discussed below.

Within the tri-national region of southern Mexico, northern Guatemala, and Belize, the species occurs in three small populations or subpopulations: (1) In the Usamacinto watershed in eastern Chiapas, Mexico, which is located in the Lacandon forest (part of the Maya Forest), Mexico's largest remaining expanse of tropical evergreen forest, and which includes the approximately 3,000 km² (1,158 mi²) Montes Azules Biosphere Reserve, several smaller protected areas, and the municipality of Maques de Commillas (United Nations Educational, Scientific, and Cultural Organization (UNESCO) 2012a, unpaginated; McReynolds 2011, *in litt.*; Enriquez *et al.* 2009, p. 13; Castillo-Santiago *et al.* 2007, pp. 1215, 1217; Inigo-Elias 1996, pp. 16–17, 23); (2) in the western Department of Peten in northern Guatemala, primarily in the Maya Biosphere Reserve (Garcia *et al.* 2008, entire); and (3) in southwest Belize, where it is known to breed only in the Chiquibul region, which includes Chiquibul National Park and other protected areas (Salas and Meerman 2008, p. 42). Based on field studies conducted from 1989 to 1993, Inigo-Elias (1996, pp. 96–97) estimated that there were “probably less than 200 breeding pairs” within Mexico's Usamacinto watershed. In Guatemala, the population is recently estimated to be between 150 and 250 birds (McNab 2008, p. 7; Wildlife Conservation Society Guatemala 2005, in McReynolds 2011, *in litt.*). Estimates from Belize are reported to vary from 60 to 219 individuals (McReynolds 2011, *in litt.*), but based on field observations in 2009, McReynolds (2011, *in litt.*) places the current Belize population at approximately 200 individuals. Garcia *et*

al. (2008, pp. 52–53) estimate the total population in the tri-national Maya region, based on habitat modeling and current threats, to be 399 individuals—137 in Mexico, 159 in Guatemala, and 103 in Belize. Evidence suggests the populations in Mexico, Guatemala, and Belize are not completely isolated from one another. In a recent radio telemetry study, a fledgling radio-tagged in Guatemala flew 130 km (80.8 mi) to Mexico in one day (McReynolds 2011, *in litt.*). In addition, recent studies provide evidence of gene flow between nest sites in Guatemala and Belize, and high levels of genetic diversity in the tri-national region (Schmidt and Amato 2008, p. 137).

Clum (2008, entire) presents preliminary results of a population viability analysis (PVA) of scarlet macaws in the tri-national region. The results showed that the variable most significantly and consistently impacting population growth is the percentage of successfully breeding females (Clum 2008, p. 80). In other words, events that lower female breeding success, such as poaching and nest predation, are the most important factors limiting recovery of the species in this region. Estimated, “best guess” values were used for several variables in the baseline scenario, which indicated a probability of extinction within 100 years of 12.4 percent (\pm 1.5 percent SE (standard error)). However, although useful in identifying limiting factors where management should be focused, the absolute values of PVA scenario outcomes (e.g., probability of extinction within 100 years) are generally not reliable because uncertainty in the estimates of variables can introduce substantial uncertainty in predictions and dramatically change outcome values (McGowan *et al.* 2011, entire; Clum 2008, p. 80; Beissinger and Westphal 1998, entire).

Honduras and Nicaragua

Except for a remnant population of approximately 12 or 13 pairs on the Peninsula of Cosigüina on the Pacific slope of Nicaragua (Lezama 2011, pers. comm.), the distribution of the species in these countries is now primarily limited to eastern Honduras and eastern Nicaragua. Wiedenfeld (1994, pp. 101–102) estimated the total population of Honduras to be 1,000 to 1,500 birds, located in the provinces of Olancho, Gracias a Dios, and Colon in the Mosquitia, a region of extensive forest straddling the eastern Honduras-Nicaragua border. Currently, the species occurs in eastern Olancho, western Gracias a Dios, and southeastern Colon (Portillo Reyes 2005, p. 71). The region includes several thousand square kilometers in protected areas, including the Plátano Biosphere Reserve (5,000 km² (1,931 mi²)) in Honduras, and the Bosawás Biosphere Reserve (21,815 km² (8,423 mi²)) in adjacent Nicaragua (UNESCO 2012b, unpaginated; UNESCO 2012c, unpaginated; Vallely *et al.* 2010, p. 52). McReynolds (2011, *in litt.*) estimates the population of the Rus Rus area of the Honduran Mosquitia alone to be 1,000 to 1,500 birds, based on the number of chicks reported as poached by Portillo Reyes *et al.* (2004, in McReynolds 2011, *in litt.*) and assuming a 20 percent reproductive success rate. Based on literature sources from the 1990s, Anderson *et al.* (2004, p. 465) report the scarlet macaw as “common” within the Honduran Mosquitia. More recent information, however, indicates that loss of habitat and demand for the pet trade has put the species in danger of extinction in this region (Portillo Reyes 2005, in Portillo Reyes *et al.* 2010, p. 6).

Wiedenfeld (1995, in Snyder *et al.* 2000, p. 150) estimated the Nicaragua population of scarlet macaw to be 1,500 to 2,500 birds. However, the species was not detected during either of two national surveys of parrots conducted in 1999 and 2004 (Lezama *et al.* 2004, in

McReynolds 2011, *in litt.*). The species is currently thought to number up to 700 in Nicaragua, with groups of 30 to 40 scarlet macaws frequently reported in the Rio Coco area, which forms the border with Honduras (Lezama 2010, in McReynolds 2011, *in litt.*). Feria and de los Monteros (2007, in McReynolds 2011, *in litt.*), however, consider the number in eastern Nicaragua to be fewer than 100 birds.

Costa Rica

Vaughan *et al.* (1991, abstract) describe scarlet macaws as having previously occurred in tropical wet and dry forests throughout most of Costa Rica, while Ridgely (1981, p. 252) describes the species as having always occurred primarily on the Pacific slope of the country. Dear *et al.* (2010, p. 8) describe the species as currently occurring in only two viable populations: in central Costa Rica's Central Pacific Conservation Area (ACOPAC) in the region of Carara National Park (approximately 450 birds) (Arias *et al.* 2008, in McReynolds 2011, *in litt.*), and in southwest Costa Rica's Osa Conservation Area (ACOSA) in the region of Corcovado National Park and the Osa Peninsula (estimates ranging from between 800 and 1,200 to 2,000 birds) (Dear *et al.* 2005 and Guzman 2008, in McReynolds 2011, *in litt.*). These two populations appear to be genetically isolated (Nader *et al.* 1999, entire). Dear *et al.* (2010, p. 8) report that small groups of 10 to 25 individuals are also found in other parts of the country, including Palo Verde (Pacific slope of northwest Costa Rica), Barra del Colorado (Atlantic slope of northeast Costa Rica), and Estrella Valley (Atlantic slope of southeast Costa Rica), and that the species has been released in several areas on the Pacific coast. Further, Penard *et al.* (2008, in McReynolds 2011, *in litt.*) report a population of 48 to 54 birds in Maquenque National

Wildlife Refuge, on the Atlantic slope border with Nicaragua, and according to Chassot (2011, pers. comm.), this population appears to be increasing. Based on plausible regional estimates, McReynolds (2011, *in litt.*) estimates the current population for the country to be about 1,800 birds.

Citing Chassot *et al.* (2006), McReynolds (2011, *in litt.*) indicates that in a 2006 review of all parrot populations in Costa Rica, participants believed the scarlet macaw was most accurately described by the International Union for the Conservation of Nature (IUCN) category of “Minor Risk-Almost Threatened.” Vaughan *et al.* (2005, entire) show that in 1995, the scarlet macaw population in the ACOPAC region was declining, due primarily to poaching of nestlings for the pet trade, and that the population increased following intensive conservation efforts in 1996 and 1997. In ACOSA, Dear *et al.* (2010, p. 10) indicate that 85 percent of residents interviewed in 2005 believed scarlet macaws were more abundant than 5 years prior, which suggests this population may be increasing.

Panama

Ridgely (1981, p. 253) describes the species as almost extinct on the mainland of Panama, but “abundant” and occurring in “substantial numbers” on Coiba Island, which, at the time, was a penal colony where settlement and most hunting was prohibited. McReynolds (2011, *in litt.*) provides a review of the more recent available information on distribution and abundance in the country as follows:

Panama has very few Scarlet Macaws. The last sightings of Scarlet Macaws in the border region of Panama and Costa Rica, the area of the upper Rio Corotu (or Rio Bartolo Arriba) near Puerto Armuelles in the Chiriquí province, occurred in 1998 (Burica Press, 2007). There is a small, but unknown number, in Cerro Hoya National Park in the southwest corner of the Azuero Peninsula of Veraguas (Rodriguez & Hinojosa, 2010). The current population of Scarlet Macaws in Panama is very likely less than 200. Isla Coiba remains the last large stronghold, with a rumored estimate of 100 individuals (Keller & Schmitt, 2008), or “large populations” (Barranco, 2009).

South America

Within northern South America, the scarlet macaw currently occurs primarily in the Amazon Biome of eastern Columbia, Venezuela, Guyana, Suriname, French Guyana, Brazil, northeast Ecuador, eastern Peru, and northern Bolivia (collectively referred to in this document as the Amazon) (BLI 2011a, unpaginated; Inigo-Elias 2010, unpaginated; Juniper and Parr 1998, p. 425; Collar 1997, p. 421; Forshaw 1989, pp. 406–407). The Amazon comprises not only most of the South America range of the species but also approximately 83 percent of its world range (BLI 2011c, unpaginated). The scarlet macaw is also reported to occur in relatively small areas outside the Amazon, including in parts of several northern Venezuelan states (Hilty 2003, p. 327) and west of the Andes in northwest Columbia (Hilty and Brown 1986, p. 200).

Using Panjabi’s (2008, in BLI 2011a, unpaginated) estimate of fewer than 50,000 for the range wide population, and Wiedenfeld’s (1994, p. 102) estimate of 5,000 for Mesoamerica, the

South American population of the scarlet macaw can be very roughly estimated to be fewer than 45,000 birds. The species is generally considered common over much of its South American range, especially in the Amazon Basin (Hilty 2003, p. 327; Angehr *et al.* 2001, p. 161; Juniper and Parr 1998, p. 425; Collar 1997, p. 421; Forshaw 1989, p. 406; Hilty and Brown 1986, p. 200; Ridgely 1981, p. 251). Juniper and Parr (1998, p. 425) describe the species as evidently declining throughout its range due to habitat loss, trade, and hunting. Others report it as having declined around major population centers and settlement areas (Ridgely 1981, p. 251; Forshaw 1989, p. 407).

We are aware of little recent information on local (country, region) populations within South America. Lloyd (2004, p. 270) provides the only local population estimate we are aware of, which includes the Tambopata Province of Peru. Using density estimates calculated from field counts in different forest types, and area of forest cover presented in Kratter (1995, in Lloyd 2004, p. 269), Lloyd calculated the Tambopata population to number from 4,734–24,332 individuals. The species was previously described as uncommon, locally extirpated in areas, and declining in eastern Peru (Inigo-Elias 2010, unpaginated, citing several sources; Brightsmith 2009, *in litt.*; Forshaw 1989, p. 407, citing several sources). In 2004, the scarlet macaw was classified as “Vulnerable” in Peru, likely due to concerns about overexploitation for the pet trade (Brightsmith 2009, *in litt.*). However, a 2009 species review classified the species in Peru at the lower threat category of “Near-Threatened” based on (1) evidence suggesting the pet trade threat is lower than previously believed, and (2) the proximity of scarlet macaws in Peru to the existence of “large populations” in adjacent Ecuador, Brazil, Bolivia, and Columbia (Brightsmith 2009, *in litt.*).

The remaining information on the species' populations in South America is qualitative. Citing several published works from the 1970s and 1980s, Forshaw (1989, p. 407) described the scarlet macaw as locally extirpated from areas of northeastern Ecuador and northeastern Bolivia. In the lowland Ecuadorian Amazon, scarlet macaws are reported to have suffered a rapid decline in recent decades and are considered a "Near-Threatened" species in Ecuador (Ridgely and Greenfield 2001, in Karubian *et al.* 2005, p. 618). The species is believed to be common in the Orinoco and Amazon Basins in Columbia, patchily distributed and becoming rare in Venezuela, and occurring in large numbers throughout the Amazon in Brazil (Inigo-Elias 2010, unpaginated, citing several sources).

Conservation Status

The scarlet macaw is listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (United Nations Environment Programme–World Conservation Monitoring Center (UNEP-WCMC) 2012, unpaginated). The species is currently classified as "Least Concern" by the IUCN. In 2011, BLI proposed reclassifying the scarlet macaw from IUCN "Least Concern" to "Threatened," based on the area of Amazon habitat projected to be lost to deforestation by 2050 (BLI 2011b, unpaginated; BLI 2011e, unpaginated). However, based on review and recommendations from regional experts, a current revision of the proposal recommends the species remain classified as "Least Concern" due to its level of tolerance of degraded and fragmented habitat (BLI 2011c, unpaginated).

The scarlet macaw is considered in danger of extinction in Mexico (Government of Mexico 2010a, p. 64), Belize (Biodiversity and Environmental Resource Data System of Belize 2012, unpaginated; Meerman 2005, p. 30), Costa Rica (Costa Rica Sistema Nacional de Areas de Conservacion 2012, unpaginated), and Panama (Fundación de Parques Nacionales y Medio Ambiente 2007, p. 125). The species is also on Guatemala's *Listado de Especies de Fauna Silvestre Amenazadas de Extinción (Lista Roja de Fauna)* (list of species threatened with extinction (red list of fauna)) (Government of Guatemala 2001, p. 15), Honduras's *Listado Oficial de Especies de Animales Silvestres de Preocupación Especial en Honduras* (Official List of Species of Wild Animals of Special Concern in Honduras) (Secretaria de Recursos Naturales y Ambiente. 2008, p. 62), and Nicaragua's list of species for which the season of use (e.g., for harvest or capture) is indefinitely closed (Nicaragua Ministerio del Ambiente y Los Recursos Naturales 2010, entire). In South America, the species is listed as vulnerable in Peru (Government of Peru 2004, p. 276855), but a more recent evaluation of the species categorizes it at the lower threat level of "near threatened" (Brightsmith 2009, *in litt.*). The species is also categorized as "near threatened" in Ecuador (Ridgely and Greenfield 2001, in Karubian *et al.* 2005, p. 618) and as "near threatened" on Venezuela's red list (Rodriguez and Rojas-Suarez 2008, p. 50). We are unaware of the scarlet macaw having official conservation status in any other of the species' range countries.

Conservation Measures

Some of the current range of the scarlet macaw is located within officially designated protected areas (see ***Distribution and Abundance***). Other conservation measures employed in

some areas of the species' range include increasing the presence of agency or organization personnel in nest areas to deter nest poaching, introduction of captive-reared birds into the wild, re-introduction of wild-caught birds into the wild, placement of artificial nest boxes within nesting areas, and public outreach and community organization efforts (Wildlife Conservation Society (WCS) 2010, pp. 2–3; WCS 2009, pp. 2–3; Garcia *et al.* 2008, p. 54; WCS 2008, entire; Brightsmith *et al.* 2005, entire; Dear *et al.* 2005, abstract; Vaughan *et al.* 2005, entire; Vaughan *et al.* 2003, entire; Brightsmith 2000a, entire; Brightsmith 2000b, entire; Vaughan *et al.* 1999, entire; Nycander *et al.* 1995, entire). To the extent that we have information indicating the effects of these measures on the scarlet macaw's status, they are considered and discussed within our evaluation of threats below.

Evaluation of Threats

Introduction

This status review focuses on the scarlet macaw populations in Mexico's southeastern state of Chiapas; Central America; and the Amazon Biome in South America. Although the species is also reported to occur in small numbers in Oaxaca, Mexico, and areas of Venezuela and Columbia that lie outside the Amazon, there is little information on the species in these areas and these areas constitute a relatively small fraction of the species' worldwide range. As discussed above, the Amazon constitutes 83 percent of the species' world range (BLI 2011c, unpaginated), and most information from South America is from the Amazon. However, we

request information from the public on the status of, and threats to, scarlet macaws that occur in South America outside the Amazon, and in Oaxaca, Mexico.

Factor A: Present or threatened destruction, modification, or curtailment of habitat or range

One of the main threats to neotropical parrot species, in general, is loss of forest habitat (Snyder *et al.* 2000, p. 98). Deforestation (conversion of forest to other land uses such as agriculture) and forest degradation (reduction in forest biomass, such as through selective cutting of trees or fire) occur across much of the range of the scarlet macaw. The primary cause is conversion of forest to agriculture (crop and pasture), although other land uses, including construction of roads and other infrastructure, logging, fires, oil and gas extraction, and mining also contribute significantly and to varying degrees in different areas of the species range (Blaser *et al.* 2011, pp. 263, 290, 299, 310, 334, 344, 354, 363–364, 375, 394; Boucher *et al.* 2011, entire; Clark and Aide 2011, entire; Food and Agriculture Organization (FAO) 2011a, p. 17; May *et al.* 2011, pp. 7–13; Muller and Patry 2011, p. 81; Nasi *et al.* 2011, pp. 203–204; Pacheco 2011, entire; DeFries *et al.* 2010, abstract; FAO 2010a, p. 15; Government of Costa Rica 2010, pp. 38–39; Jarvis *et al.* 2010, entire; Belize Ministry of Natural Resources and Environment 2010, pp. 41–45; Armenteras and Morales 2009, pp. 134–176; Garcia *et al.* 2008, pp. 50–51; Grau and Aide 2008, unpaginated; Harvey *et al.* 2008, p. 8; Kaimowitz 2008, pp. 487–491; Mosandl *et al.* 2008, pp. 38–39; Nepstad *et al.* 2008, entire; Foley *et al.* 2007, pp. 26–27; Barreto *et al.* 2006, entire; Fearnside 2005, pp. 681–683; Carr *et al.* 2003, entire). Deforestation poses a potential threat to the scarlet macaw because it directly eliminates the species' tropical forest habitat, removing the trees that support the species' nesting, roosting, and dietary requirements. It may also result in fragmented habitat that reduces and isolates populations; as fragments are reduced, they are less likely to provide resources for species that require large areas, and small

areas of forest may only support small populations of a species (Ibarra-Macias 2009, entire, citing several sources; Lees and Peres 2006, entire; Lindenmayer and Fischer 2006, in Ibarra-Macias *et al.* 2011, p. 703). Fragmented habitat could potentially compromise the genetics of these populations through inbreeding depression and genetic drift (see **Factor E**).

Forest degradation poses a threat to the species because it may reduce the number of trees in an area. Although scarlet macaws are known to use partially cleared and cultivated landscapes (see **Habitat**), they are only able to do so if the landscape maintains enough adequate large trees to support the species' nesting and dietary requirements. A reduced number of trees may reduce the availability of adequate nest sites and food resources across the landscape, resulting in a reduction in the number of scarlet macaws the landscape can support and, thus, a reduction in the species' population. Scarlet macaws are especially dependent on larger, older trees because these trees provide the large nesting cavities required by the species. One of the causes of forest degradation within the species' range, selective logging, generally targets older, larger trees, thus posing a threat to parrot populations by creating a shortage of suitable nesting sites, increasing competition, and causing the loss of current generations through an increase in infanticide and egg destruction (Lee 2010, pp. 2, 12).

Deforestation and forest degradation also pose a threat to scarlet macaws through indirect effects. In the absence of management for maintenance of tree density or regeneration, forest degradation may eventually lead to full deforestation or degradation to low-stature brush ecosystems (Boucher *et al.* 2011, p. 6; May *et al.* 2011, pp. 11, 13–16; Nasi *et al.* 2011, p. 201; Gibbs *et al.* 2010, p. 2; Government of Mexico 2010b, p. 32; Nepstad *et al.* 2008, pp. 1739–

1740; Foley *et al.* 2007, pp. 26–27; Killeen 2007, pp. 25–27; Fearnside 2005, pp. 682–683).

Also, clearing or degradation of forests often provides easier access by humans to previously inaccessible areas inhabited by the species. Easier access by humans increases the vulnerability of species to overexploitation (Peres 2001, entire; Putz *et al.* 2000, pp. 16, 23) (see **Factor B**) and also threatens the species because increased access to forests is also often followed by full deforestation as lands are cleared for agricultural use (Kaimowitz and Angelsen 1998, in Putz *et al.* 2000, p. 16).

Below we provide a summary of information on deforestation and forest degradation within the range of the scarlet macaw.

Mesoamerica

Destruction of forest habitat is one of the main causes of the decline of the scarlet macaw in Mesoamerica (CONABIO 2011, p. 5; Lezama 2011, pers. comm.; McGinley *et al.* 2009, p. 11; Garcia *et al.* 2008, p. 50; Hansen and Florez 2008, pp. 48–50; Snyder *et al.* 2000, p. 150; Collar 1997, p. 421; Forshaw 1989, p. 406; Ridgely 1981, pp. 251–253). Although much of the species' habitat within South America remains intact, the habitat of the species in Mesoamerica has changed substantially over the past several decades as a result of deforestation.

Mesoamerica has had among the highest deforestation rates in the world, and all countries in the region lost much (up to 50 percent) of their forest during recent decades (Bray 2010, pp. 92–95; Kaimowitz 2008, p. 487; Carr *et al.* 2006, pp. 10–11; Dejong *et al.* 2000, pp. 506; Rzedowski 1978, in Masera *et al.* 1997, p. 273). The remaining forest is fragmented and includes few large

tracts of forest habitat (Bray 2010, pp. 92–93; Snyder *et al.* 2000, p. 150; Wiedenfeld 1994, p. 101). Although deforestation rates have declined in Mesoamerica during the past two decades, they are still very high (FAO 2010a, pp. 232–233; Kaimowitz 2008, p. 487) and include the loss of significant amounts of primary forest (FAO 2010a, pp. 55, 259). Further, deforestation is occurring rapidly in many areas within the range of the scarlet macaw in this region, including in Chiapas, Mexico, western Petén in Guatemala; eastern Olancho in Honduras; and eastern Nicaragua (Kaimowitz 2008, p. 487).

Mexico

During 1990–2010, Mexico lost approximately 6 million hectares (ha) (approximately 15 million acres (ac)) of forest, and had one of the largest decreases in primary forests worldwide (FAO 2010a, pp. 56, 233). Although Mexico’s rate of forest loss has slowed in the past decade, it continues at a rate of 1,550 km² (598 mi²) per year, with an estimated 2,500–3,000 km² (965–1,158 mi²) per year degraded (FAO 2010a, p. 233; Government of Mexico 2010c, in Blaser *et al.* 2011, p. 344). Most of Mexico’s remaining scarlet macaws occur in the Lacandon Forest of the southeastern state of Chiapas (see ***Distribution and Abundance***). The main drivers of deforestation and forest degradation in this region are conversion of forest to pasture and agriculture, and uncontrolled logging (overexploitation and illegal logging) (Government of Mexico 2010b, pp. 22–24; Jimenez-Ferrer *et al.* 2008, p. 195 – 196; Castillo-Santiago *et al.* 2007, p. 1217; Oglethorpe *et al.* 2007, p. 85). In southeastern Mexico, the area of land devoted to cattle farming has increased dramatically due to the increase of regional meat prices and a decrease in the economy of staple crop cultivation (Jimenez-Ferrer *et al.* 2008, pp. 195–196).

The state of Chiapas encourages cattle farming through subsidies (Enriquez *et al.* 2009, p. 58), and clearing of forest for pasture in the state is ongoing (Enriquez *et al.* 2009, p. 48–49).

Chiapas has the second highest rate of deforestation of Mexico's 31 states, with recent forest losses averaging approximately 600 km² (232 m²) per year (Masek *et al.* 2011, p. 10). Cattle farming is the most profitable activity within the Lacandon Forest and is extensive in the region (Jimenez-Ferrer *et al.* 2008, pp. 195–196). Deforestation risk outside protected areas in the Lacandon Forest is primarily categorized as high to very high. Inside protected areas, the risk of deforestation is categorized as low to very low (Secretaria de Medio Ambiente y Recursos Naturales 2011, unpaginated). Monte Azules Biosphere Reserve is the largest protected area in the Lacandon Forest, and studies indicate that it has been relatively successful at conserving the resources within its boundaries (Castillo-Santiago *et al.* 2007, pp. 1223–1224; Figueroa and Sanchez-Cordero 2008, p. 3231). However, according to Enriquez *et al.* (2009, pp. 28, 57), the reserve is one of 32 priority forest regions defined by Mexico's Federal Environmental Protection Agency in which more than 60 percent of illegal logging in the country occurs.

Although illegal logging has received more attention from Mexico's policy makers recently, efforts to address the problem have had limited success due to insufficient human and financial resources to enforce laws effectively, and poorly designed control efforts (Blaser *et al.* 2010, p. 346; Enriquez *et al.* 2009, p. 57; Kaimowitz 2008, p. 491). Ongoing illegal logging within the reserve is likely degrading the reserve's forests, as illegal logging is usually conducted using unsustainable methods (Enriquez *et al.* 2009, p. 56). Degradation through illegal logging may affect nesting trees and food resources, and may result in future deforestation if not effectively addressed. While we are unaware of information on projected future rates of deforestation specifically in the Lacandon Forest region, Diaz-Gallegos *et al.* (2010, p. 194) project a loss of

approximately 20,000 km² (7,722 mi²) between 2000 and 2015 in the southeastern States (which include Chiapas), assuming the same rate of loss as occurred during the period 1987–2000.

Further, by 2030, forest area in Mexico as a whole is projected to decrease, with anywhere from about 10 percent to nearly 60 percent of mature forests lost, and approximately 0 to 54 percent of regrowth forests lost (Commission for Environmental Cooperation 2010, pp. 45, 75).

Although Mexico implements several forest conservation measures and has made significant progress in conserving forest within its boundaries (Blaser *et al.* 2011, pp. 344–346; Center for International Forestry Research (CIFOR) 2010, pp. 34–39; Masek *et al.* 2011, p. 17; FAO 2010a, p. 233; Perron-Welch 2010, entire; Enriquez *et al.* 2009, pp. 4, 36–41; Munoz-Pina *et al.* 2008, entire; Karousakis 2007, pp. 24–25, 29), we consider deforestation and forest degradation to be an immediate threat to the species in Mexico because (1) clearing of forest for pasture is ongoing in Chiapas, (2) the Lacandon Forest outside of protected areas is at high to very high risk of deforestation, (3) illegal logging is ongoing in the largest reserve in the Lacandon Forest and attempts to address the problem of illegal logging in Mexico have had limited success, and (4) deforestation is projected to continue in Mexico as a whole and in the southeastern states.

Guatemala, Belize, Honduras, and Nicaragua

With the exception of Belize, the countries of northern Central American have the highest rates of deforestation in Latin America. Guatemala, Honduras, and Nicaragua lost

560 km² (216 mi²) (or 1.47 percent), 1,200 km² (463 mi²) (or 2.16 percent), and 700 km² (270 mi²) (or 2.11 percent) per year, respectively, between 2005 and 2010 (FAO 2010a, p. 232). Belize, has a much lower deforestation rate (100–150 km² (39–58 mi²) (0.3–0.68 percent) per year (Cherrington *et al.* 2010, p. 22; FAO 2010a, p. 232)), but deforestation and forest degradation is increasing in the Chiquibal region, the only region in which scarlet macaws are known to nest in the country (Belize Ministry of Natural Resources and Environment 2010, pp. 44–45; Salas and Meerman 2008, pp. 22, 42).

The main causes of deforestation and forest degradation within the range of the scarlet macaw in these countries include clearing for agriculture and cattle pasture, illegal colonization in protected areas, illegal logging, purposefully set fires, and, in some areas, activities related to drug trafficking. Some or all of these activities are ongoing in areas occupied by the species, including in the Maya Biosphere Reserve in Guatemala, Rio Platano Biosphere in Honduras, Bosawas Biosphere Reserve in Nicaragua, and the Chiquibul region in Belize, resulting in the loss of significant amounts of forest area in locations in which the few remaining scarlet macaw populations in these countries occur (Blaser *et al.* 2011, pp. 310, 334; Friends for Conservation and Development 2011, pp. 1, 4; Muller and Patry, 2011, pp. 80–81; Radachowsky *et al.* in press, pp. 5–7; UNEP-WCMC 2011a, unpaginated; UNESCO 2011a, unpaginated; UNESCO 2011b, unpaginated; Belize Ministry of Natural Resources and the Environment 2010, pp. 44–46; Bray 2010, pp. 100–106; Tolisano and Lopez-Selva 2010, pp. 3–4; Anderson and Devenish 2009, pp. 256–257; Government of Honduras 2009, unpaginated; McGinley *et al.* 2009, pp. 13, 33–36; McNab 2009, unpaginated; Muccio 2009, p. 14; Davalos and Bejarano 2008, p. 223; Garcia *et al.* 2008, pp. 50–54; Grau and Aide 2008, unpaginated; Hansen and Florez 2008, p. 21;

Kaimowitz 2008, pp. 487, 490; Reynolds 2008, p. 6; Wade 2007, entire; Parkswatch 2005, unpaginated; Conservation International 2004, pp. 13–14; Parkswatch 2003, p. 1; Richards *et al.* 2003, entire; WCS undated, pp. 10–11). Deforestation and forest degradation are exacerbated in this region by the combination of weak governance (e.g., limited resources and capacity for law enforcement, lack of reasonable enforcement strategies, poorly designed and complex legislation, corruption, and weak commitment in judicial systems), increasing human populations placing demands on forest resources, and the increasing presence of drug trafficking and other illegal activities, which create an environment of insecurity and undermine conservation efforts (Boucher *et al.* 2011, p. 11; Larson and Petkova 2011, p. 100; Pellegrini 2009, pp. 15–19; UNESCO 2011a, unpaginated; WCS 2011, p. 4; Balzotti 2010, pp. 4, 15, citing several sources; Belize Ministry of Natural Resources and Environment 2010, pp. 5, 41–42, 45; Meerman and Cayetano 2010, pp. 32–33; Science for Environment Policy 2010, entire; Tolisano and Lopez-Selva 2010, pp. 2, 38, 42–43, 47–49; Union of Concerned Scientists 2010, unpaginated; WCS 2010, p. 4; McGinley *et al.* 2009, pp. 34–37; WCS 2009, pp. 5–6; Davalos and Bejarano 2008, p. 223; Hansen and Florez 2008, pp. 21–26; Salas and Meerman 2008, pp. 43–45; Bray *et al.* 2008, unpaginated; Kaimowitz 2008, pp. 488, 490; Ogilethorpe *et al.* 2007, p. 87; Conservation International 2004, pp. 3, 12–13; Richards 2003, entire). Although forest conservation efforts in Guatemala’s Maya Biosphere are currently preventing further habitat loss in the range of about 75 percent of Guatemala’s scarlet macaw population (Boyd and McNab 2008, pp. v–vi), this area is currently unstable (Human Rights Watch 2012, pp. 1–2; United Nations High Commissioner for Human Rights in Guatemala 2012, pp. 6, 14; U.S. Department of State 2012, unpaginated; Dudley 2011, pp. 12–13, 15; Southern Pulse 2011, unpaginated; Radachowsky *et al.* in press, p. 5; Dudley 2010, p. 14; Farah 2010, unpaginated; Schmidt 2010, unpaginated; Muccio 2009, p.

14; Parkswatch 2005; Parkswatch 2003). Several high-profile violent crimes in the area during 2010–2011 resulted in violent confrontations between authorities and organized criminals and a declaration of a state of siege in the area by Guatemala’s president and cabinet (WCS 2011, p. 4). The increased violence and fear of retaliation by criminals has hindered enforcement and prosecution of law in the area, and, along with turnover in political administrations and key political and agency personnel, pose significant risk to forest conservation efforts in the Maya Biosphere Reserve (WCS 2011, pp. 4–5; WCS 2010, pp. 4–5).

Although forest conservation measures exist in the other countries in this region (Belize Ministry of Natural Resources and Environment 2010, pp. 54–58; Bray 2010, pp. 99, 102–103, 106; Hansen and Florez 2008, pp. 9–12, 17–20; Kaimowitz 2008, pp. 488–491; McGinley *et al.* 2009, pp. 27–33), we are unaware of any information indicating these conservation measures are significantly reducing deforestation and forest degradation within the current range of the species. For this reason, and because (1) the much reduced and limited forest habitat in these countries is still being cleared in these countries, and (2) the habitat of up to 25 percent of Guatemala’s population is still at high threat of being deforested or degraded, and the protection of the other 75 percent appears tenuous, we consider deforestation and forest degradation to be occurring a level that poses a significant and immediate threat to scarlet macaws in all four countries in this region.

Costa Rica and Panama

Costa Rica experienced some of the highest rates of deforestation in the world during past decades (Bray 2010, p. 107; Government of Costa Rica 2010, p. 68). As a result of deforestation, the country's forest cover declined from 67 percent in 1940, to 17–20 percent in 1983 (Bray 2010, p. 107), and in 1993, only 20 percent of original scarlet macaw habitat remained, all within protected areas (Marineros and Vaughan 1995, pp. 445–446). However, during the 1990s, Costa Rica implemented several forest conservation strategies, including new laws protecting forests and mechanisms of payment for ecosystem services (Bray 2010, pp. 107–109; Kaimowitz 2008, pp. 488–491; Pagiola 2008, entire; Sanchez-Azofeifa *et al.* 2003, entire). Subsequently, forest cover has been increasing in the country (a process referred to as afforestation). Costa Rica is the only country in Central America to experience a positive change in forest cover. Between 2000 and 2010, Costa Rica had afforestation rates of between 0.90 and 0.95 percent per year (FAO 2010a, p. 232), and total forest cover in 2005 was estimated to be 53 percent (Government of Costa Rica 2010, p. 68), more than double the country's forest cover in the 1980s. Some level of deforestation still occurs in some areas of the country due to illegal logging in private forests, illegal activities in national parks and reserves, and expansion of agriculture and livestock activities (Government of Costa Rica 2011, p. 2; Government of Costa Rica 2010, pp. 10–11, 38, 52–54; Parks in Peril 2008, unpaginated). Corcovado National Park, the largest protected area in ACOSA, has been identified as one of the protected areas in Costa Rica most affected by deforestation close to its boundaries (Sanchez-Azofeifa *et al.* 2003, pp. 128–129). However, the scarlet macaw population in this region appears to be increasing (see *Distribution and Abundance*), and we are unaware of any information indicating that deforestation or forest degradation in the current range of the scarlet macaw in Costa Rica is occurring at a level that is causing or likely to cause a decline in the species. The government of

Costa Rica has proposed building an international airport in ACOSA, where the larger of Costa Rica's two populations of scarlet macaws occurs (Driscoll *et al.* 2011, p. 9; Walsh 2011, unpaginated). So far, the remoteness of the ACOSA has deterred large-scale development in the region. If the airport is built, it may lead to development of the region in the form of large-scale resorts, vacation homes, new roads, and other infrastructure, placing the habitat of the ACOSA population of scarlet macaws at high risk of accelerated deforestation (Driscoll 2011, p. 9; Natural Resources Defense Council 2011, unpaginated). However, based on the available information, whether or when the airport will be built, and the nature of subsequent development in the region, is speculative at this time. Therefore, it is not appropriate to make a determination of the scarlet macaw's status in the country, for the purposes of listing under the Act, based on this potential development project.

Deforestation in Panama is relatively low for the Mesoamerica region (120 km² (46 mi²), or 0.36 percent, per year) (FAO 2010a, p. 232). Deforestation in the country currently occurs primarily in the Darien, Colon, Ngabe Bugle, and Bocas del Toro provinces (Blaser *et al.* 2011, p. 354), which are outside the range in which scarlet macaws in Panama are currently reported to occur. As mentioned above (see ***Distribution and Abundance***), most of Panama's scarlet macaw population occurs on Coiba Island. Coiba Island, which is approximately 494 km² (191 mi²), was used by the government of Panama as a penal colony until 2004, which limited previous human access and development on the island (Government of Panama 2005, p. 23; Steinitz *et al.* 2005, p. 26). Consequently, forests on the island remain largely intact. Coiba National Park was established, by law, in 2004, and is currently a World Heritage Site (Suman *et al.* 2010, p. 7; Government of Panama 2005, p. 11). Available information indicates that some level of

deforestation or forest degradation on the island is occurring as the result of vegetation trampling and soil erosion by a herd of approximately 2,500 to 3,500 feral cattle (Smithsonian Tropical Research Institute 2011, unpaginated; Suman *et al.* 2010, p. 25). Although the removal of cattle from Coiba National Park is considered a priority issue (Suman *et al.* 2010, p. 25), the cattle removal effort has had few results to date (UNESCO 2011c, p. 61). The herd is reported to be growing and increasingly impacting the island's vegetation (Smithsonian Tropical Research Institute 2011, unpaginated), although the extent of this impact is unknown. Because Coiba National Park has been classified as a World Heritage Site, UNESCO evaluates threats to the park using a standard method it developed for this purpose. They categorize threats to Coiba National Park as increasing since 2008 (UNESCO 2012d, unpaginated). The United Nations (UNESCO 2011c, pp. 59–63; UNEP-WCMC 2011b, unpaginated) reports several potential threats to the park, including insufficient capacity to control expected pressures from fishing, tourism, and possible illegal colonization and logging; delayed implementation of management plans; and impacts of a newly constructed naval station on Coiba Island. Although we are unaware of information on the probability or extent of impacts to scarlet macaw habitat from these threats, the World Heritage Centre and IUCN concluded that the main conservation concerns regarding this site remain poorly addressed.

Evidence suggests that within southern Central America, deforestation and forest degradation are a current threat to scarlet macaws in Panama, but not in Costa Rica. Although we are aware of little information on the magnitude and extent of deforestation and forest degradation on Panama's Coiba Island, we consider deforestation and forest degradation to be a significant threat to the scarlet maaws in Panama because (1) feral cattle are known to be

currently impacting the forest on Coiba Island; (2) conservation concerns, including the elimination of feral cattle, remain poorly addressed on the island; (3) most of the scarlet macaws in the country occur on this island; (4) the number of scarlet macaws in the entire country (fewer than 200) is extremely small and thus more vulnerable to extinction (see **Factor E**); (5) the range of the species in this country is highly restricted, primarily to Coiba Island which is only approximately 494 km² (191 mi²); and (6) scarlet macaws have large home ranges (see **Movements**) and thus require large areas to survive. In Costa Rica, the species numbers between approximately 800 and 2,000 in ACOSA, and approximately 450 in ACOPAC. We are not aware of any information indicating that habitat loss or destruction is affecting the population in ACOPAC. Despite the occurrence of activities causing some level of deforestation in ACOSA, the best available information suggests scarlet macaws in ACOSA may be increasing in numbers (see **Distribution and Abundance**). For these reasons, we do not consider deforestation or forest degradation to be occurring at a level that is likely to have a negative impact on the species in Costa Rica, either now or in the foreseeable future.

South America

As indicated above, we focus here on the Amazon region and request information from the public on the status of the species in areas of Columbia and Venezuela (see **Information Requested**) that lie outside the Amazon Biome.

The Amazon is the world's greatest expanse of tropical forest, originally covering 6.2 million km² (2.4 million mi²) (Hansen *et al.* 2010, p. 2; Foley *et al.* 2007, p. 25; Killeen 2007, p.

11; Soares-Filho *et al.* 2006, p. 522; Myers and Myers 1992, in Bird *et al.* 2011, p. 1). Although it has the world's highest absolute rate of deforestation (FAO 2010a, pp. 232–233; Hansen *et al.* 2008, entire; Neptstad *et al.* 2008, p. 1350; Laurance *et al.* 2002, p. 738), vast tracts of remote, intact forest still remain (Government of Guyana 2010, p. 6; Hansen *et al.* 2010, p. 2; Jarvis *et al.* 2010, p. 185; Vergara and Scholz 2010, p. 3; Love *et al.* 2007, p. 63; Barreto *et al.* 2006, pp. 45–53; Soares-Filho *et al.* 2006, pp. 521–522). As of 2003, forest cover of the region was an estimated 5.3 million km² (2.0 million mi²) (Soares-Filho *et al.* 2006, p. 522). To date, approximately 18 percent of the region's forest has been cleared with average annual losses of approximately 18,000 km² (6,950 mi²) per year (Instituto Nacional de Pesquisas Espaciais 2011, in Bird *et al.* 2011, p. 1). A roughly equal amount is estimated to be degraded by selective logging (Foley *et al.* 2007, p. 27; Asner *et al.* 2005, entire). Deforestation and forest degradation in the Amazon are largely the result of the expansion of agriculture, cattle ranching, and logging. Other factors also contribute, especially the construction of roads that provide access to previously remote areas and allow further expansion of agriculture, ranching, mining, and other activities that result in more forest clearing and degradation (Davidson *et al.* 2012, p. 323; Lambin and Meyfroidt 2011, pp. 3468–3469; May *et al.* 2011, pp. 6, 9–11; Barona *et al.* 2010, entire; Foley 2007, pp. 26–27; Barreto *et al.* 2006, pp. 25–26; Morton *et al.* 2006, entire; Soares-Filho *et al.* 2006, p. 520; Asner *et al.* 2005, entire; Fearnside 2005, pp. 681–683; Laurance *et al.* 2004, entire). Eighty percent (Malhi *et al.* 2008, p. 169) of the deforestation in the Amazon occurs in Brazil, the country in which the majority of the Amazon lies (Blaser *et al.* 2011, p. 274). During 2005–2009, Brazil lost approximately 10,700 km² (4,131 mi²) of Amazon forest per year (Blaser *et al.* 2011, p. 275). Deforestation in the Amazon occurs primarily along the south and east edge of the Amazon Basin in the Brazilian states of Rondonia, Para, Mato

Grosso, and Acre, an area referred to as the “arc of deforestation” (Hansen *et al.* 2008, p. 9440; Malhi *et al.* 2008, p. 169; Soares-Filho *et al.* 2006, pp. 521–522; Asner *et al.* 2005, entire), and in the northern state of Roraima (Instituto Nacional de Pesquisas Espaciais (INPE) 2005, in Asner *et al.* 2005, p. 480). The remaining 20 percent of deforestation in the Amazon occurs in the remaining seven countries and one territory that comprise the region. Recent average deforestation rates for these countries and territory, which in some cases includes forest loss in areas outside the Amazon and outside the range of the scarlet macaw, vary from nearly 0 (Guyana, Suriname, French Guiana) to approximately 3,080 km² (1,189 mi²) (Bolivia) per year (FAO 2010a, p. 233).

Deforestation in the Amazon is ongoing and expected to continue into the future. Soares-Filho *et al.* (2006, p. 522) estimate loss of Amazon closed canopy forest via modeling of different potential future scenarios. The most pessimistic “business as usual” scenario investigated by Soares-Filho *et al.* assumes that recent deforestation trends will continue, highways scheduled for paving will be paved, compliance with environmental legislation will remain low, new protected areas will not be created, and up to 40 percent of the forests inside and 85 percent of the forests outside of protected areas will be deforested (Soares-Filho *et al.* 2006, p. 520). Results indicate that Amazon closed canopy forest will be reduced under this scenario from its current 5.3 million km² (2.0 million mi²) to an estimated 3.2 million km² (1.2 million mi²) (53 percent of its original area), and that future deforestation will continue to be concentrated primarily in the eastern and southern Brazilian Amazon. Large blocks of remote forest outside Brazil and in most of the northwest Brazilian Amazon are projected to remain largely intact until 2050 (Soares-Filho *et al.* 2006, p. 522). Soares-Filho *et al.* consider their

results to be conservative because they did not consider forest degradation due to logging and fire, the potential effects of global warming, or the loss of savannas. However, others suggest projected losses under Soares-Filho *et al.*'s "business as usual" conditions may be too high because rates of deforestation in the Amazon have declined during recent years (Bird *et al.* 2011, p. 6), and Soares-Filho *et al.* modeled future scenarios using 1997–2002 deforestation rates that don't take into account recent trends (Soares-Filho *et al.* 2006b, pp. 4–6)). While deforestation in the Brazilian Amazon during 1996–2005 averaged approximately 19,500 km² (7,529 mi²) per year, it averaged only about 7,000–10,000 km² (2,702–3,861 mi²) per year during 2005–2009 due to several factors, likely including extensive conservation efforts by the Brazilian government (Blaser *et al.* 2011, p. 275; May 2011, pp. 16–18; Nepstad *et al.* 2009, p. 1350). Nepstad *et al.* (2008, entire) combined Soares-Filho *et al.*'s pessimistic scenario with the future effects of drought and logging. They project 31 percent of the Amazon's closed canopy forest would be deforested and 24 percent would be degraded by 2030. Nepstad *et al.*'s (2008, p. 1741) results also show large tracts of Amazon forest remaining outside Brazil and in northwest Brazil.

Using the results of Soares-Filho *et al.*'s most pessimistic and optimistic scenarios, BirdLife International (BLI) (2011c, unpaginated) projects the scarlet macaw will lose 21.4 to 35 percent of its Amazon habitat within three generations (38 years). Although this constitutes a loss of up to more than a third of the species' habitat in the region, evidence suggests that scarlet macaws occur and are generally common throughout the Amazon (see ***Distribution and Abundance***) and that large areas of intact forest will remain in the region into the future, even under pessimistic conditions. Further, due to the species level of tolerance of fragmented or

degraded habitats, projected losses of forest habitat are expected to result in less than a 25 percent decline in the scarlet macaw population (BLI 2011c, unpaginated). Therefore, we do not consider deforestation or forest degradation to be a threat to the species in the Amazon now or in the foreseeable future.

Summary of Factor A

Deforestation and forest degradation are a threat to the scarlet macaw in some areas of its current range. Deforestation is a significant threat throughout the range of the subspecies *A. m. cyanoptera* (Mexico south to Nicaragua), where most of the species' historical habitat has been eliminated, the remaining habitat is fragmented, and habitat occurs mainly in the few large isolated tracts of forest remaining in the region. Deforestation rates in the region are the highest in Latin America, and are often associated with illegal activities that, due to weak governance in the region, are difficult to control. Evidence indicates that deforestation and forest degradation is ongoing throughout the range of *A. m. cyanoptera*, and we are unaware of information indicating these activities have been abated. As such, because scarlet macaws require large areas of habitat to meet their biological requirements, the subspecies' range is limited and fragmented, and deforestation is rapid and ongoing in these countries and occurs within the range of the few remaining scarlet macaw populations in the region, we conclude that habitat destruction or modification occurs at a level that is having a negative impact on the subspecies *A. m. cyanoptera* throughout its range. In Costa Rica, previous levels of deforestation eliminated much of the forest in Costa Rica, including approximately 80 percent of scarlet macaw habitat. However, current practices in Costa Rica have resulted in a reversal in this trend; forest cover in

the country has increased substantially over the past 10 to 15 years and continues to increase. Although some level of deforestation is occurring in the ACOSA, scarlet macaw numbers appear to be increasing in this region, suggesting that habitat loss or modification is not posing a significant threat to the species in this country. In Panama, where one extremely small population of the species occurs, and in a severely restricted range, mainly on Coiba Island, the threat to habitat posed by feral cattle and other factors likely pose a significant immediate threat to the scarlet macaws in this country.

Despite threats to scarlet macaws in Mesoamerica, in the Amazon, where the vast majority of the species' current range occurs, most of the species' forest habitat remains intact and remote from human impacts. Although extensive deforestation and forest degradation occur in the Amazon, primarily on its south and east margins, even under pessimistic circumstances, approximately half (53 percent, or over 2 million km² (0.8 million mi²)) of the Amazon forest, including large blocks of remote intact forest habitat, are projected to remain until at least 2050. Although a decline in forest cover under this scenario is likely to cause a decline in scarlet macaw numbers, the level of the decline is unlikely to place the species in danger of extinction in the foreseeable future because large areas of the species' habitat will remain.

Although the scarlet macaw is threatened by deforestation in most of Mesoamerica, this area comprises less than 17 percent of the species' range. Because the species is considered common throughout the Amazon, which comprises most (about 83 percent) of the species' current range, and large tracts of intact Amazon forest are projected to remain in this region even under pessimistic deforestation conditions, we do not consider habitat destruction and

modification to be a threat to the species throughout its entire range now or in the foreseeable future. In conclusion, although the scarlet macaw is threatened by habitat destruction or modification in some regions of its range, we do not consider habitat destruction and modification to be a threat, either now or in the foreseeable future, to the species throughout its range. However, we consider habitat destruction and modification to be an immediate threat to the subspecies *A. m. cyanoptera* throughout its range (Mexico, Guatemala, Belize, Honduras, and Nicaragua), and to the subspecies *A. m. macao* in Panama.

Factor B: Overutilization for commercial, recreational, scientific, or educational purposes

Parrots and macaws have been used for centuries in the neotropics, as pets, as a source of ornamental feathers, and for food (Cantu-Guzman *et al.* 2007, p. 9; Guedes 2004, p. 279; Snyder *et al.* 2000, pp. 98–99). The threat of overutilization of most species is primarily attributed to capture for the pet trade (Wright *et al.* 2001, p. 711; Snyder *et al.* 2000, p. 150). Parrots have been traded for centuries in the neotropics (Cantu-Guzman *et al.* 2007, p. 9; Guedes 2004, p. 279; Snyder *et al.* 2000, pp. 98–99) and in the past several decades, capture for the pet trade and habitat loss have become the main threats to many parrot species (Guedes 2004, p. 279; Wright *et al.* 2001, p. 711).

As with other parrots, the scarlet macaw is a long-lived species with a low reproductive rate (Lee 2010, p. 3; Thiollay 2005, p. 1121; Wright *et al.* 2001, p. 711). As a result, the species is slow to recover from harvesting pressures, and these pressures can have a particularly devastating effect on the species (Lee 2010, p. 3; Thiollay 2005, p. 1121; Wright *et al.* 2001, p.

711; Munn *et al.* 1989, p. 410); removal of individuals year after year can stop population growth and cause local extirpations (Cantu-Guzman *et al.* 2007, p. 14). Both poaching of chicks from nests and trapping adults are used for capturing scarlet macaws (Arevalo 2011, unpaginated; Dear *et al.* 2010, p. 19; Bjork 2008, p. 15; Garcia *et al.* 2008, p. 51; Hanks 2005, pp. 88–89; Herrera 2004, p. 6; Portillo Reyes *et al.* 2004, in McReynolds 2011, *in litt.*; Gonzalez 2003, pp. 441–443; Vaughan *et al.* 2003, pp. 5, 8; Duplaix 2001, p. 7; Marineros and Vaughan 1995, p. 460). Where nestlings are targeted, there is a lag in population decline due to the long lifespan of adults (Wright 2001, p. 717). Thus, declines may not be apparent for decades. Where adults are targeted, the population is depleted more rapidly because reproductive individuals are removed from the population (Collar *et al.* 1992, p. 6). The number of individuals actually sold or exported for the pet trade only represents a portion of those removed from the population due to mortality associated with capture and transport, which is estimated to be as high as 77 percent (Cantu-Guzman *et al.* 2007, p. 60). Certain capture methods may also contribute to population declines by destroying the already limited number of trees that have suitable nest cavities (Munn 1992, pp. 55–56), thus limiting the number of pairs that can breed in an area.

The scarlet macaw is a popular pet species within its range countries (Snyder *et al.* 2000, p. 150; Wiedenfeld 1994, p. 102), and capture for sale in local markets can provide a significant source of supplemental income in rural areas (Huson 2010, p. 58; Gonzalez 2003, p. 438). Once a species becomes rare in the wild, demand often increases, creating a greater demand for the species and increasing harvesting pressure (Herrera and Hennessey 2009, p. 234; Wright *et al.* 2001, p. 717). Species priced above \$500 U.S. dollars (USD) are more likely to be imported into a country illegally, and higher prices often drive poaching rates (Wright *et al.* 2001, p. 718). The

scarlet macaw is a larger and more expensive species; prices in the United States may reach over \$2,000 USD (Cantu-Guzman *et al.* 2007, p. 73).

Legal International Trade

The United States and Europe were historically the main markets for wild birds in international trade (FAO 2011b, p. 3). Trade in parrots was particularly high in the 1980's due to a huge demand from developed countries (Rosales *et al.* 2007, pp. 85, 94; Best *et al.* 1995, p. 234). In the years following the enactment of the U.S. Wild Bird Conservation Act in 1992 (WBCA; 16 U.S.C. 4901 et seq.), studies found lower poaching levels than in prior years, suggesting that import bans in developed countries reduced poaching levels in exporting countries (Wright *et al.* 2001, pp. 715, 718). The European Union, which was the largest market for wild birds following enactment of the WBCA, banned the import of wild birds in 2006 (FAO 2011b, p. 21), thus eliminating another market for wild birds in international trade.

International trade of the scarlet macaw was initially restricted by the listing of the species in Appendix II of CITES in 1981, and, in 1985, it was transferred to the more restrictive Appendix I. CITES, an international agreement between governments, ensures that the international trade of CITES-listed plant and animal species does not threaten those species' survival in the wild. There are currently 175 CITES Parties (member countries or signatories to the Convention). Under this treaty, CITES Parties regulate the import, export, and re-export of specimens, parts, and products of CITES-listed plant and animal species (see ***Factor D*** discussion). Trade must be authorized through a system of permits and certificates that are

provided by the designated CITES Scientific and Management Authorities of each CITES Party (CITES 2010, unpaginated). In 1981, the scarlet macaw was listed in Appendix II of CITES, which includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival (UNEP-WCMC 2012, unpaginated; CITES 2010, unpaginated). In 1985, the species was transferred from Appendix II to Appendix I. An Appendix-I listing includes species threatened with extinction whose trade is permitted only under exceptional circumstances, which generally precludes commercial trade. The import of an Appendix-I species requires the issuance of both an import and export permit. Import permits for Appendix-I species are issued only if findings are made that the import would be for purposes that are not detrimental to the survival of the species in the wild and would not be for primarily commercial purposes (CITES Article III(3)). Export permits for Appendix-I species are issued only if findings are made that the specimen was legally acquired and trade is not detrimental to the survival of the species in the wild, and if the issuing authority is satisfied that an import permit has been granted for the specimen (CITES Article III(2)).

On the same date that the scarlet macaw was placed in Appendix I, Austria, Switzerland, Liechtenstein, and Suriname entered a reservation stating that they would not be bound by the provisions of CITES relating to international trade in scarlet macaws (Austria withdrew its reservation in 1989) (UNEP-WCMC 2012, unpaginated). A reservation means that these countries are treated as non-CITES parties with respect to the species concerned. However, if a country with a reservation on a particular species wishes to trade in that species with a country that has not taken the same reservation, then that trade is subject to the CITES permit requirements.

Based on CITES trade data obtained from the United Nations Environment Programme–World Conservation Monitoring Center CITES Trade Database, from the time the scarlet macaw was transferred to CITES Appendix I in 1985 through 2010, 14,210 specimens of scarlet macaw were reported in international trade. Of these, 5,981 were live birds, 6,171 were feathers, and the remainder were such items as eggs, dead bodies, derivatives, and scientific specimens. In analyzing these data, it appears that a number of records in the database may be over-counts due to slight differences in the manner in which the importing and exporting countries reported their trade. It is likely that the actual number of scarlet macaw specimens in international trade during this period was 13,075, of which 5,175 were live birds, and 5,850 were feathers. Because the scarlet macaw is listed in Appendix I of CITES, legal commercial international trade, especially trade in specimens obtained from the wild, is limited. Of the 13,075 specimens that were likely in trade between 1985 and 2010, the majority (7,890, or 60 percent) were either captive-born or captive-bred, pre-convention specimens, from unknown sources, or were confiscated or seized due to lack of certification or authorization to import. The remaining 5,185 (40 percent) were wild specimens (including 2,454 feathers, 1,716 live birds, 940 scientific specimens, 3 bodies, 1 derivative, and 71 unspecified). Of these wild specimens, only 834 (16 percent) were traded for commercial purposes. All 834 were live birds, of which 831 (99.6 percent) were exported from Suriname (the other three were exported from Honduras). The remaining 4,351 wild specimens were traded for educational, captive propagation, scientific, personal, or similar purposes. Regardless of purpose, most (1,629, or 95 percent) of the total of 1,716 live, wild-sourced scarlet macaws that were in trade during 1985 to 2010 were exported from Suriname.

Suriname is the only scarlet macaw range country that filed a reservation on the transfer of the species from CITES Appendix II to the more restrictive Appendix I. Suriname is one of only two countries in South America that still legally export significant quantities of wildlife (Duplaix 2001, p. ii). Wildlife exports generate significant income and jobs in Suriname, and the country has set an annual voluntary export quota of from 100 to 133 scarlet macaws for the past several years (UNEP-WCMC 2012, unpaginated). Suriname's wildlife export quotas are reported to be "realistic" in that they are based on the belief that larger parrots cannot sustain large harvests (Duplaix 2001, pp. 10, 65, 68). Further, actual exports of CITES listed species are often lower than Suriname's allowed quotas (FAO 2010b, p. 42; Duplaix 2001, p. 10).

Because most specimens of scarlet macaw reported in trade were from non-wild sources, were seized, or were feathers rather than whole birds, and because most wild-sourced, live birds were exported from Suriname, which is reported to set realistic quotas, we have determined that legal international trade controlled via valid CITES permits is not a threat to the species.

Despite regulation of international scarlet macaw trade through CITES, there is still some level of illegal international trade in wild scarlet macaws (Snyder *et al.* 2000, p. 150; Duplaix 2001, p. 8), although most harvested birds probably remain within the species' range countries (Snyder *et al.* 2000, p. 150).

Illegal Trade in Mesoamerica

The scarlet macaw is particularly threatened by capture for the pet trade in Mesoamerica, where the species' populations are isolated and small. The scarlet macaw is protected by domestic laws within all countries in Mesoamerica (Nicaragua Ministerio del Ambiente y Los Recursos Naturales 2010, pp. 3708–3709; Traffic North America (Traffic NA) 2009, pp. 40, 44–46; Animal Legal and Historical Center 2008, unpaginated; Keller and Schmitt 2008, abstract; Pereira 2007, p. 34; Parker *et al.* 2004, Annex H, unpaginated; CITES 2001, p. 7; Government of Belize 2000, entire; Renton 2000, p. 255). However, the agencies responsible for enforcing wildlife laws in these countries generally do not have the resources or funding to adequately enforce these laws (Traffic NA 2009, p. 20; Valdez *et al.* 2006, p. 276; Mauri 2002, entire). The general public perception in the region is that the probability of being punished for breaking wildlife-related laws is low, and that, even if caught, sanctions dictated by law are usually not applied. Further, low salaries and high unemployment in the region drives people to search for additional sources of income (Traffic NA 2009, pp. 23–24). As a result, scarlet macaws are still captured throughout the region and traded illegally (see the following subsections).

Mexico, Guatemala, and Belize

Poaching occurs at significant levels in the Maya Forest region of Mexico, Guatemala, and Belize, where the three subpopulations total approximately 400 scarlet macaws. Although information on the extent of poaching in Mexico is unavailable, according to Boyd and McNab (2008, p. xiii), reproductive success is almost certainly lower in Mexico than in Guatemala, where many nests are protected. Cantu-Guzman *et al.* (2007, p. 35) indicate that up to 50 scarlet macaws are captured annually in Mexico, although some of these may be from Central American

countries. Further, detained traffickers report that parrot populations in Chiapas (the primary state in which the species occurs in Mexico) have decreased so much that trapping is now conducted in natural protected areas in Chiapas (Cantu-Guzman *et al.* 2007, p. 14). In Guatemala, much of the scarlet macaw population is currently protected through conservation efforts. However, up to 25 percent is not protected, and it is likely that most unprotected nests in the country are poached (Garcia *et al.* 2008, p. 51; Boyd and McNab 2008, pp. v–vi). In Belize, Arevalo (2011, unpaginated) reports that 50 percent, 47.4 percent, and 89 percent of monitored nests were poached in 2008, 2010, and 2011, respectively. Modeling research indicates that poaching is one of the most important factors influencing scarlet macaw population growth in the Maya Forest and that relatively low levels of poaching could result in population declines (Clum 2008, pp. 76, 78–80).

Honduras and Nicaragua

Little quantitative information on poaching of scarlet macaws in Nicaragua and Honduras is available, although poaching of the species is recognized as a problem in these countries (Traffic NA 2009, p. 5). Capture of parrots for the pet trade is described as common in Nicaragua (Herrera 2004, p. 1), and up to four times as many parrots are captured than make it to market due to mortalities during capture and transport (Engebretson 2006, in Weston and Mamon 2009, p. 79). Evidence indicates that parrot populations in Nicaragua have declined by as much as 60 percent since the mid-1990s, although loss of habitat has also likely contributed to this decline (Nicaragua Ministerio del Ambiente y Los Recursos Naturales (MARENA) 2008, p. 51). Scarlet macaws are one of the three most preferred species in Nicaragua's parrot trade and are

among the main CITES species harvested for illegal trade in the country (McGinley *et al.* 2009, p. 16; Lezama 2008, abstract; MARENA 2008, p. 25). In Honduras, the scarlet macaw population appears to have decreased since 2005, and, according to Lafeber Conservation & Wildlife (2011, unpaginated), the scarlet macaw is experiencing severe reproductive limits due to poaching. In a 2010–2011 survey of 20 parrot nests, 16 of which were scarlet macaw nests, 17 showed evidence of past or recent poaching (Lafeber Conservation & Wildlife 2011, unpaginated). In 2003, an estimated 200 to 300 chicks were poached in the Rus Rus area alone (Portillo Reyes *et al.* 2004, in McReynolds 2011, *in litt.*). Although quantitative information on the impacts of poaching on scarlet macaws is not available for these countries, the available evidence suggests poaching is occurring at significant levels.

Costa Rica

Scarlet macaws in Costa Rica have experienced heavy poaching pressure in the recent past. In field studies conducted in the 1990s, 56 to 64 percent of evaluated nest sites in the Carara National Park region showed signs of being poached (Vaughan *et al.* 2003, pp. 6, 8; Snyder *et al.* 2000, p. 150; Marineros and Vaughan 1995, p. 460). Vaughan *et al.* (2005, pp. 127) suggest intense anti-poaching efforts in this region during 1995–1996 may have resulted in increased recruitment into the population. The authors also suggest the scarlet macaw population was self-sustaining from 1996–2003, despite heavy poaching pressure. However, poaching pressure appears to be increasing in this region. Officials in Carara National Park indicate that poaching of wildlife is becoming more prominent and is believed to be occurring at unsustainable levels (Huson 2010, p. 19). Park officials believe lack of funding and capacity

prevents them from effectively controlling poaching in the park. From 2004 to 2009, there were only 26 seizures of poached animals, totaling 31 animals. Although most (39 percent) of these were paca (*Cuniculus paca*), poached animals also included scarlet macaw chicks (Huson 2010, p. 19), and scarlet macaws were among the top four species identified by park officials as most at risk of poaching or local extinction or both (Huson 2010, p. 20). Based on surveys of local residents, Huson (2010, entire) estimated the number of individuals poached of six species (three birds and three mammals). While a relatively small portion of the estimated number of individuals hunted or extracted from the park were scarlet macaws, approximately 19 scarlet macaw chicks were estimated to be removed from the park per month, although the author indicated that, due to limitations of the study, this estimate is likely exaggerated (Huson 2010, p. 59).

Human population densities and accessibility in ACOSA are lower than in ACOPAC, and estimates of the scarlet macaw population in ACOSA range from 800–1,200 to 2,000 individuals. During 2005, Dear *et al.* (2010, entire) interviewed 105 non-randomly selected residents (with knowledge of wildlife or long-term residency) at 35 sites in ACOSA about scarlet macaws in their area. Interview responses suggest the level of poaching has decreased in the region. However, poaching still occurs and still threatens the population (Dear *et al.* 2010, p. 19). Interview responses suggest that 25–50 scarlet macaw chicks are poached annually (Dear *et al.* 2010, p. 19). Additionally, Guittar *et al.* (2009, pp. 390, 392) report that of 57 potential nest cavities found in ACOSA in 2006, 11 (19 percent) were reported by local residents as recently poached, although the authors suggest the actual number of nests poached is likely greater.

Although 85 percent of ACOSA residents interviewed by Dear *et al.* (2010, p. 10) believed scarlet macaws were more abundant in 2005 than in 2000, and scarlet macaws were not determined to be at risk of extinction during a 2006 review of parrot populations in Costa Rica (see ***Distribution and Abundance***), interviews of residents by Guittar *et al.* (2009, p. 390) suggest a significant proportion (19 percent) of nests in ACOSA are poached. Further, recent information suggests poaching of wildlife is on the rise and has reached unsustainable levels in ACOPAC. Because (1) scarlet macaws are susceptible to overharvest due to their demographic traits and naturally low rate of reproduction, (2) the populations in Costa Rica are additionally at risk because they are relatively small and are isolated, (3) poaching at one of the only two viable populations in the country is on the rise and park officials believe they do not have the resources to control it, and (4) a significant proportion of nests in the other of the two viable populations are reported to be poached, it is reasonable to conclude that poaching is having a significant impact on the species in Costa Rica. Thus, we consider poaching to be a significant threat to the species in Costa Rica.

Panama

Little information is available on capture of scarlet macaws for trade in Panama. Coiba and Cerro Hoya National Parks are located within Panama's most impoverished province (Government of Panama 2005, p. 36). According to Parker *et al.* (2004, p. II-6), trade in rare and endangered species is a constant threat in the country, due to the high prices paid for these animals and their parts. Although poaching is not identified as a main threat to biodiversity within Coiba and Cerro Hoya National Parks (Parker *et al.* 2004, Annex G, unpaginated), capture

for the illegal pet trade is identified as being a threat to the species in this country (Keller and Schmitt 2008, abstract). For these reasons, it is reasonable to conclude that some level of poaching of scarlet macaws likely occurs in the country, although at what level is unknown. However, because the current population of scarlet macaws in Panama is extremely small (fewer than 200 individuals) and isolated, and the species' demographic traits and low rate of reproduction render them susceptible to overharvesting, even low levels of poaching would likely have a negative effect on the population in Panama. Thus, we consider poaching to be a significant threat to the species in Panama.

Illegal Trade in South America

There is evidence of a market for national and international parrot trade within the range of the scarlet macaw in South America, much of which involves illegally traded birds (Gastañaga *et al.* 2011, entire; Lee 2010, p. 12; Herrera and Hennessey 2007, pp. 296–297). However, there is little evidence that scarlet macaws are a significant part of that trade. Gonzalez (2003, entire) reported results of a parrot-harvesting study in northeast Peru during 1996–1999, which suggested that the illegal harvest of scarlet macaws was not sustainable and posed a long-term threat to the species. However, according to Brightsmith (2009, *in litt.*), recent studies indicate that scarlet macaws are not particularly common in Peru's national pet trade. Only 38 scarlet macaws were seen during over 500 visits to Peru markets during 2007–2009 (Brightsmith 2009, *in litt.*). A study conducted in wildlife markets in eight of Peru's capital cities detected only four scarlet macaws during quarterly surveys conducted over a 1-year period during 2007 to 2008 (Gastanaga *et al.* 2011, entire). In Bolivia, a study conducted in Santa Cruz, a city that receives

much of the trade from Bolivia's lowland savannas and rainforest, recorded 7,279 individual parrots at a market during a 1-year period, 306 of which were macaws (Herrera and Hennessy 2007, p. 297). However, only 4 of these were scarlet macaws. A later report by the same authors (2009, p. 233) recorded only 50 scarlet macaws during a 4-year period in the same market. In Guyana, Hanks (2005, p. 27, 84) reports that trappers on the Courantyne River system in Guyana sell about 200 scarlet macaws every trapping season, despite the country's zero quota for the species. However, Hanks also indicates the species is fairly common in Guyana. Hanks (2005, p. 8) also reports anecdotal information that indicates captured scarlet macaws are smuggled between Guyana and Suriname.

Scarlet macaws are generally considered common and widespread within the Amazon. Although there is evidence that some level of illegal trade of scarlet macaws occurs within the Amazon, and that harvesting of the species was heavy at one time in northeast Peru, evidence suggests the current level of trade is low. Although the study by Gonzalez (2003, entire) suggests a high level of harvest of the species in northeast Peru, a more recent and national scale study suggests a low level of scarlet macaw trade in the country. Based on what little information exists on non-CITES regulated trade in South America, it appears that this trade does not occur at a level that would put the species in danger of extinction in this region now or in the foreseeable future.

Hunting

Scarlet macaws are known to be hunted in some areas of their range for meat or feathers (Maldonado 2010, p. 60; Salas and Meerman 2008, p. 42; Heemskerk and Delvoye 2007, p. 300; Thiollay 2005, entire; Burger and Gothfeld 2003, p. 23; CITES 2001, p. 7; Duplaix 2001, pp. 7, 64; Ridgely and Gwynne 1989, p. 173; Munn 1992, pp. 56–57; Saffirio and Skaglion, 1982, p. 321). However, information on the effects of hunting on scarlet macaw populations is limited. Maldonado (2010, entire) reported that parrot species comprised only 40 (1.9 percent) of a total of 2,101 game species harvested by subsistence hunters during a 4-year period over approximately 400 km² (154 mi²) of the Columbian Amazon. Only one scarlet macaw was reported harvested during the study, although harvested animals also included 31 unidentified macaws in the genus *Ara*. Thiollay (2005, p. 1129) reported that encounter rates and mean flock size of *Ara* macaws in French Guiana were significantly higher in non-hunted than regularly hunted sites. Hunted sites were easily accessible and disturbed to some degree, whereas non-hunted sites were pristine, undisturbed forest. Although the study indicates that current levels of macaw hunting in French Guiana may be unsustainable in regularly hunted areas, the portion of forest regularly hunted in this country is likely extremely low. Ninety-five percent of French Guiana forest is undisturbed primary forest (FAO 2010a, p. 14, 54). Further, French Guiana has a very low human population density (Van Andel *et al.* 2003, p. 66; Hanks 2005, p. 16; United Nations Department of Economic and Social Affairs 2010, entire), has the highest proportion (98 percent) of its area in forest than any other country or territory in the world (FAO 2010a, p. 14), and much of its forest is not easily accessible (Comptes économiques rapides pour l’Outre-mer (CEROM) 2008, pp. 4, 7–8). Thus, much of French Guiana’s forest is unlikely to be as regularly hunted as the hunted sites reported by Thiollay. A study conducted in southeast Peru indicates that the number of large macaws is significantly lower in areas subject to moderate to intense

hunting, and that even moderate levels of hunting appeared to be sufficient to extirpate large macaws from large regions of the Amazon (Munn 1992, pp. 56–57). However, the levels at which the scarlet macaw is hunted across the Amazon are unknown. Thus, it is difficult to determine whether hunting poses a threat to the species in this region. We are unaware of any information on current levels of hunting in Mesoamerica. Illegal xaté (palms of the genus *Chamaedorea*) collectors are known to kill scarlet macaws for food in the Chiquibul Forest of Belize (Salas and Meerman 2008, p. 42), but the extent of this activity is unknown. In Guatemala's Maya Biosphere Reserve forest concessions, Radachowsky *et al.* (in press, p. 7) found that densities of large terrestrial birds were three times lower in areas of high human access than in areas with difficult access. Although this may suggest hunting has an impact on scarlet macaw populations, in the case of parrot species like the scarlet macaw, these declines may also be the result of poaching for the pet trade.

Although hunting may pose a threat to scarlet macaws in some areas, we are not aware of any information indicating that hunting occurs at a level that places the species in danger of extinction throughout all or any part of its range. We are also not aware of any information indicating that hunting may place the species in danger of extinction within the foreseeable future throughout all or any portion of its range.

Recreational, Scientific, or Educational Purposes

We are not aware of any information indicating that overutilization for recreational, scientific, or educational purposes is a threat to the species anywhere in the species' current range.

Summary of Factor B

Overutilization of scarlet macaws, primarily as a result of poaching for the pet trade, is a threat to the scarlet macaw in some areas of its current range. Capture for the pet trade is a significant and immediate threat to the species throughout the range of the subspecies *A. m. cyanoptera* (Mexico, Guatemala, Belize, Honduras, and Nicaragua), where the species occurs mainly in small, isolated populations. Evidence suggests poaching occurs at significant levels in the Maya Forest region, where modeling indicates that even moderate levels of poaching could cause a decline in already small populations. Although quantitative data from Honduras and Nicaragua are lacking, evidence suggests poaching occurs at significant levels in this region as well. Within the range of the subspecies *A. m. macao* in Costa Rica, evidence indicates poaching of wildlife in one of the two viable populations in the country has increased to unsustainable levels, and increased access to, and thus likely poaching of, the second population will likely increase in the foreseeable future as the result of an expanding transportation network in the region. Although information is limited in Panama, it is reasonable to conclude that some level of poaching occurs because trade in rare and endangered species is a constant threat in the country due to the high prices paid for these animals and their parts, and poaching has been identified specifically as a threat to scarlet macaws in this country. Further, because the population is isolated and extremely small, it is also reasonable to conclude that any level of

poaching on this population poses a significant threat to the species. We are not aware of any information indicating that poaching levels in any of these countries will decrease at any time in the foreseeable future.

Despite the threat of overutilization of scarlet macaws in Mesoamerica, the available information suggests that overutilization is not a threat in the Amazon of South America, where the vast majority of the species' current range and worldwide population occurs. Scarlet macaws are generally considered common in the Amazon, and the Amazon comprises approximately 83 percent of the species' global range. Therefore, although we consider overutilization to be occurring at significant levels throughout Mesoamerica, we conclude that overutilization due to commercial, recreational, scientific, or educational purposes is not occurring at a level that poses a significant threat to the species throughout its range now or in the foreseeable future.

Factor C. Disease or predation

Disease

Infectious diseases can pose many direct threats to individual birds as well as entire flocks (Abramson *et al.* 1995, p. 287), and parrots are susceptible to a variety of lethal, infectious diseases, including, among others, Pacheco's disease (psittacine herpesvirus), proventricular dilatation disease, beak and feather disease, and Newcastle's disease (Kistler *et al.* 2008, p. 1; Rahaus *et al.* 2008, p. 53; Tomaszewski *et al.* 2006, p. 536; Brightsmith *et al.* 2005, p. 465; Abramson *et al.* 1995, pp. 288, 293, 296; Gaskin 1989, entire; Panigrahy and Grumbles

1984, p. 811). However, most of the available research on disease in parrots addresses captive-held birds, while information on the health of parrots in the wild is scarce (Karesh *et al.* 1997, p. 368). Burton and Brightsmith (2010, entire) tested parrots, including wild and hand-reared scarlet macaws, at a site in Peru for the presence of *Salmonella* and found no evidence of the disease in these birds, although over 30 percent of domestic fowl at the site tested positive. Karesh *et al.* (1997, entire) tested scarlet macaws, and other macaws, for several diseases at a different site in Peru and detected the presence of two diseases, *Salmonella* spp. and psittacine herpesvirus, in some birds. However, Karesh *et al.* did not identify which species or strain of *Salmonella* was infecting the macaws they tested, and the effects of infection by salmonella are highly dependent on several factors, including the virulence of the strain and the susceptibility of the host species (Friend 1999, p. 103). Further, the effects of psittacine herpesvirus can vary, and the prevalence or clinical significance of the disease in free-ranging species is unknown (Karesh *et al.* 1997, pp. 374–376). Nycander *et al.* (1995, p. 433) detected three types of ectoparasites (botflies, mites, and lice) on macaw (*Ara* sp.) nestlings at a site in Peru. Three out of 63 nestlings appeared to have died from infestations of these organisms. Nycander *et al.* also report the presence of intestinal parasites (*Ascaris galli* and *Heterakis* sp.) and a blood parasite (*Plasmodium elongatum*), but affected nestlings appeared healthy or showed no signs of clinical symptoms. Although these and other diseases could negatively affect scarlet macaws, we are not aware of any information indicating that disease poses a significant threat to the species as a whole, although it may pose a greater threat to small, isolated populations in parts of the species' range (see **Factor E**).

Predation

Few predators (e.g., hawk eagles) are large enough to capture adult macaws, and predators that are large enough occur at naturally low densities (Brightsmith *et al.* 2005, p. 469). Consequently, it is likely that predation of adults is uncommon, and that most predation occurs on eggs, nestlings, and newly fledged birds. These earlier life stages are reported to be predated mainly by raptors (birds of prey), reptiles, and small to medium-sized mammals. Predators and potential predators include falcons (*Micrastur semitorquatus*, *Micrastur ruficollis*, *Falco ruficularis*), toucans (*Ramphastos swainsonii*, *R. cuvieri*, *Pteroglossus castanotis*), black iguanas (*Ctenosaura similis*), tayras (*Eira barbara*, a large weasel), monkeys (*Ateles paniscus*, *Saimiri sciureus*, *Cebus capucinus*), opossums (*Didelphis marsupialis*), rats (unknown sp.), and cockroaches (unknown sp.) (Renton and Brightsmith 2009, p. 5; Garcia *et al.* 2008, pp. 51–52; Anleu *et al.* 2005, p. 45; Vaughan *et al.* 2003, p. 10; Inigo-Elias 1996, p. 83; Nycander *et al.* 1995, p. 433).

Few studies on the level and effects of predation on scarlet macaw populations have been reported. In Guatemala, where the population is very small, cameras placed in five nests recorded predation of three chicks by collared forest falcons (*Micrastur semitorquatus*) (Garcia *et al.* 2008b, in Garcia *et al.* 2008a, pp. 51–52; WCS 2008, p. 3). Scarlet macaws usually hatch one or two chicks (Garcia *et al.* 2008a, p. 61; Inigo-Elias 1996, pp. 80–81; Nycander 1995, p. 431), thus 30–60 percent of the observed chicks were predated. Species with long generation times and low reproductive rates, such as the scarlet macaw, take longer to recover from population declines, especially when populations are small. They are, therefore, more vulnerable to extinction via increases in mortality rates (Owens and Bennett 2000, p. 12146; Owens and

Bennett 1997, abstract). Garcia *et al.* (2008, p. 50) identify predation as one of the four main threats to the species in Guatemala. In southeast Peru, Nycander *et al.* (1995, pp. 431–433) report that predators took substantial numbers of macaw (*Ara* sp.) eggs and young at a site in southeast Peru, but they provide no indication that predation posed a significant threat to any of the three macaw species (including scarlet macaws) studied. Twenty percent of scarlet macaw eggs were predated, and 30 percent of chicks died from predation or parasite infection. Also in southeast Peru, Brightsmith (2010, unpaginated) reports only 1 percent to 8 percent of scarlet macaw nests fail as a result of predation, and also provides no indication that this level of predation poses a threat to the species.

Summary of Factor C

Although scarlet macaws are subject to disease and predation, and predation appears to be a threat to individuals in Guatemala, we found no evidence that disease or predation is occurring at a level that places the species in danger of extinction at this time or is likely to place the species in danger of extinction in the foreseeable future.

Factor D: Inadequacy of existing regulatory mechanisms

Habitat Destruction and Modification

Scarlet macaws occur in and require forest habitat for their survival. National forest policy and the legal framework related to forests constitute the basis for sustainable forest

management (FAO 2010a, pp. 150). With the exception of Belize, all scarlet macaw range countries have a national or subnational policy framework on forests and their management. Of those countries with a policy framework, all but Colombia have specific national forest laws in support of these policies, but laws supporting national forest policy in Colombia are incorporated within other laws. All range countries except Belize and Venezuela also have National Forest programs that provide the framework to develop and implement their forest policies, although the status of Panama's program is unknown (for information on regulatory mechanisms pertaining to forest management in scarlet macaw range countries see: Claros *et al.* 2011, entire; Espinosa *et al.* 2011, pp. 21–26; FAO 2011c, p. 78; Government of Columbia 2011, pp. 89–91, 203–211; Guignier 2011, pp. 12–22; Larson and Petkova 2011, entire; May *et al.* 2011, pp. 16–55; Meerman *et al.* 2011, entire; Stern and Kernan 2011, pp. 52–54, 88–90; United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD) 2011, unpaginated; Belize Ministry of Natural Resources and Development 2010, pp. 54, 57–58; Blaser *et al.* 2010, pp. 263–267, 277–281, 291–293, 300–302, 311–312, 320–323, 334–337, 345–346, 365–367, 376–377, 394–396; CIFOR 2010, p. 45; FAO 2010a, pp. 150–158, 302–303; Government of Belize 2010, pp. 27–34; Sparovek 2010, pp. 6046–6047; Tolisano and Lopez-Selva 2010, pp. 24–28; Bauch *et al.* 2009, entire; McGinley *et al.* 2009, pp. 18–30; Patriota 2009, pp. 612–615; Trevin and Nasi 2009, entire; Byers and Israel 2008, pp. 29–34; Torres-Lezama *et al.* 2008, entire; Hopkins 2007, pp. 398–405; Playfair 2007, entire; Portilla and Eguren 2007, pp. 19–32; World Bank 2007, pp. 10–28, 71–76; Clark 2006, pp. 19–29; Grenand *et al.* 2006, pp. 49, 54–56; Baal 2005, unpaginated; Parker *et al.* 2004, pp. III-1–III-8, Annex H, Annex I; Government of Belize 2003, entire; Bevilacqua *et al.* 2002, pp. 6–9; Mauri 2002, entire; Vreugdenhil *et al.* 2002, pp. 6–10).

As discussed above under Factor A, we do not find habitat destruction or modification to be occurring at a level that poses a significant threat to the species throughout all of its range. Thus, it is reasonable to conclude that the regulating mechanisms addressing this threat are adequate at protecting the species at a global level. Therefore, we conclude that inadequacy of existing regulatory mechanisms for addressing habitat destruction or modification is not a threat to the scarlet macaw throughout all of its range. However, we determined that habitat destruction or modification in the form of deforestation and forest degradation occurs at a level that is likely to negatively impact the species throughout all of the range of the subspecies *A. m. cyanoptera*, and in the range of the subspecies *A. m. macao* in Panama. Because deforestation and forest degradation are ongoing and pose immediate significant threats to scarlet macaws in these regions, it is reasonable to conclude that the regulatory mechanisms addressing this threat in these regions are inadequate. Therefore, we conclude that the inadequacy of existing regulatory mechanisms for addressing habitat destruction or modification are a significant immediate threat to the subspecies *A. m. cyanoptera* throughout all of its range, and the subspecies *A.m. macao* in Panama.

Trade

A variety of laws, regulations, and decrees form the policy framework that governs wildlife conservation and use in scarlet macaw range countries, including national implementing legislation for a variety of multilateral agreements such as CITES (Traffic NA 2009, pp. 11–13) (for information on regulatory mechanisms pertaining to wildlife use in scarlet macaw range

countries see: Ecolex 2012, unpaginated; Clayton 2011, unpaginated; de la Torre *et al.* 2011, entire; Embassy of the Bolivarian Republic of Venezuela in the United States 2011, unpaginated; Gastanaga *et al.* 2011, p. 77; Rincon Rubiano 2011, pp. 112–113; Traffic NA 2009, pp. 40–47; Animal Legal and Historical Center 2008, unpaginated; Byers and Israel 2008, pp. 29–34; Cantu-Guzman *et al.* 2007, pp. 24–33; Ecolex 2007a, unpaginated; Ecolex 2007b, unpaginated; Herrera and Hennessey 2007, pp. 295–296; Portilla and Eguren 2007, pp. 19–32; United Nations Environment Programme 2006, pp. 3–5; Hanks 2005, pp. 71–76; Government of Ecuador 2004, entire; Parker *et al.* 2004, pp. III-1–III-2; Van Andel *et al.* 2003, pp. 25, 49, 66–67, 80–85, 102–105, 122; CITES 2001, pp. 7–8; Duplaix 2001, pp. 3–10, 47–51, 61–63; Government of Belize 2000, entire; Global Legal Information Network 1999, unpaginated; FAO 1996, unpaginated).

As discussed above under Factor B, we do not find overutilization for commercial, recreational, scientific, or educational purposes to be a threat to the species throughout all of its range. Thus, it is reasonable to conclude that the regulating mechanisms addressing this threat are adequate at protecting the species at a global level. Therefore, we conclude that inadequacy of existing regulatory mechanisms for addressing the threat of capture for the pet trade is not a threat to the scarlet macaw throughout all of its range. However, we determined that overutilization in the form of capture for the pet trade occurs at a level that is likely to negatively impact the species throughout all of the range of the subspecies *A. m. cyanoptera*, and in the range of the subspecies *A. m. macao* in Costa Rica and Panama. Because capture for the pet trade is ongoing and poses an immediate significant threat to scarlet macaws in these regions, it is reasonable to conclude that the regulatory mechanisms addressing this threat in these regions are inadequate. Therefore, we conclude that the inadequacy of existing regulatory mechanisms for addressing overutilization for commercial, recreational, scientific, or educational purposes is a significant

immediate threat to the subspecies *A. m. cyanoptera* throughout all of its range, and the subspecies *A. m. macao* in Costa Rica and Panama.

Summary of Factor D

As discussed under Factors A, B, C, and E, we do not find the potential threats discussed under Factors A, B, C and E to occur at a level that places the species in danger of extinction throughout its range now or in the foreseeable future. Thus, it is reasonable to conclude that the regulating mechanisms addressing these potential threats are adequate at protecting the species at a global level. Therefore, we conclude that inadequacy of existing regulatory mechanisms is not a threat to the scarlet macaw throughout all of its range. However, we found potential threats discussed under Factors A and B to be a threat to the species throughout all of the range of the subspecies *A. m. cyanoptera*, and in the range of the subspecies *A. m. macao* in Costa Rica (Factor B) and Panama (Factors A and B). Because these threats are ongoing and pose immediate threats to scarlet macaws in these regions, it is reasonable to conclude that the regulatory mechanisms addressing these threats in these regions are inadequate. Therefore, we conclude that the inadequacy of existing regulatory mechanisms pose an immediate threat to the continued existence of the subspecies *A. m. cyanoptera* throughout all of its range, and the subspecies *A. m. macao* in Costa Rica and Panama.

Factor E: Other natural or manmade factors affecting the species' continued existence

Small Population Size and Cumulative Effects of Threats

Small, isolated populations place species at greater risk of local extirpation or extinction due to a variety of factors, including loss of genetic variability, inbreeding depression, demographic stochasticity, environmental stochasticity, and natural catastrophes (Lande 1995, entire; Lehmkuhl and Ruggiero 1991, p. 37; Gilpin and Soule 1986, pp. 25–33; Soule and Simberloff 1986, pp. 28–32; Shaffer 1981, p. 131; Franklin 1980, entire). The isolation of populations and consequent loss of genetic interchange may lead to genetic deterioration, for example, that has negative impacts on the population at different timescales. In the short term, populations may suffer the deleterious consequences of inbreeding; over the long term, the loss of genetic variability diminishes the capacity of the species to evolve by adapting to changes in the environment (e.g., Blomqvist *et al.* 2010, entire; Reed and Frankham 2003, pp. 233–234; Nunney and Campbell 1993, pp. 236–237; Soule and Simberloff 1986, pp. 28–29; Franklin 1980, pp. 140–144). Stochastic events that put small populations at risk of extinction include, but are not limited to, variation in birth and death rates, fluctuations in gender ratio, inbreeding depression, and random environmental disturbances such as fire, wind, and climatic shifts (e.g., Blomqvist *et al.* 2010, entire; Gilpin and Soule 1986, p. 27; Shaffer 1981, p. 131). The negative impacts associated with small population size and vulnerability to random demographic fluctuations or natural catastrophes are further magnified by synergistic interactions with other threats, such as those discussed above (Factors A, B, and C).

Small, declining populations can be especially vulnerable to environmental disturbances such as habitat loss (O’Grady *et al.* 2004, pp. 513–514). In order for a population to sustain itself, there must be enough reproducing individuals (and habitat to sustain them) to ensure its

survival. Conservation biology defines this as the “minimum viable population” (MVP) requirement (Grumbine 1990, pp. 127–128). Some studies (Traill *et al.* 2010, entire; Traill *et al.* 2007, entire; Brook *et al.* 2006, entire; Reed *et al.* 2003, entire) suggest that approximately 1,000 to 7,000 adults are required to ensure long-term survival of a species, although others argue that the general applicability of such estimates is not scientifically supported, and that they are likely to be poor estimates of any specific population (Beissinger *et al.* 2011, entire; Flather *et al.* 2011a, entire; Flather *et al.* 2011b, entire; Garnett and Zander 2011, entire). Although common and widespread in the Amazon, the scarlet macaw occurs in relatively small populations in Mesoamerica (ranging from a few pairs up to fewer than 2,000 individuals, with the total population size that is likely no greater than 4,000). Historically, the scarlet macaw in Mesoamerica existed in much higher numbers in more continuous, connected habitat. Its suitable habitat is becoming increasingly limited, and its suitable habitat is not likely to expand in the future.

The combined effects of habitat fragmentation and other factors on a species can have profound effects and can potentially reduce a species’ respective effective population (the proportion of the actual population that contributes to future generations) by orders of magnitude (Gilpin and Soulé 1986, p. 31). For example, an increase in habitat fragmentation can separate populations to the point where individuals can no longer disperse and breed among habitat patches, causing a shift in the demographic characteristics of a population and a reduction in genetic fitness (Gilpin and Soulé 1986, p. 31). This is especially applicable for scarlet macaws in Mesoamerica, where the species was once wide-ranging and has lost a significant amount of its historical range due to habitat loss and degradation. Furthermore, as a species’ or population’s

status continues to decline, often as a result of deterministic forces such as habitat loss or overutilization, it will become increasingly vulnerable to other impacts. If this trend continues, its ultimate extinction due to one or more stochastic (random or unpredictable) events becomes more likely. The scarlet macaw's current occupied and suitable range in Mesoamerica is highly reduced and fragmented. The small size of the species' populations in this region, and its reproductive and life-history traits, combined with its highly restricted and severely fragmented range, increases the vulnerability of the scarlet macaw in this region to other threats.

The global scarlet macaw population totals approximately 20,000 to 50,000 individuals. The majority of these birds occur in the Amazon, where the species is generally common and widely distributed. Further, genetic studies indicate there is a high degree of genetic variability throughout the species' range. Consequently, the risks associated with small population size do not pose a threat to the species as a whole. However, most populations in Mesoamerica are believed to range from fewer than 200 to about 700 individuals, with only two possibly numbering between 1,000 and 2,000. Therefore it is reasonable to conclude that the populations in Mesoamerica are threatened by the synergistic interactions of small population size and other threats such as those discussed in Factors A, B, and C above.

Competition for Nest Cavities

Competition for suitable nest cavities has the potential to limit reproductive success by limiting the number of pairs that can breed, or by causing nest mortality as a result of agonistic competitive interactions. Competition among different pairs of scarlet macaws, and between

scarlet macaw pairs and pairs of other macaw species, is reported to be intense in some areas (Renton and Brightsmith 2009, p. 5; Inigo-Elias 1996, p. 96; Nycander 1995, p. 428). At a remote study site in southeast Peru, competition for nest sites with other macaws was found to be the primary source of nest failure (Brightsmith 2010, unpaginated). Nevertheless, we are unaware of any information indicating that competition for nest cavities with other macaws occurs at a level that poses a threat to the species. The scarlet macaw is reported to be common in the Amazon, which encompasses the Peruvian portion of the species' range. Further, although a decline in the worldwide population of scarlet macaws is suspected (BLI 2011a, unpaginated), this suspected decline is not believed to be rapid (i.e., greater than 30 percent over 10 years or 3 generations). Further, we are not aware of any information indicating the species is declining in the Amazon (as opposed to in Mesoamerica), except in localized areas around human population centers (see *Distribution and Abundance*).

Feral Africanized honey bees (*Apis mellifera scutellata*) are also reported to compete with scarlet macaws for nest sites (Garcia *et al.* 2008, p. 52; Vaughan *et al.* 2003, p. 13; Inigo-Elias 1996, p. 61). Inigo-Elias (1996, p. 61) reported them to be “a serious problem” during his study of scarlet macaws in Mexico, and Garcia *et al.* (2008, p. 52) consider them the most serious competitor for scarlet macaw nest cavities in Guatemala. Africanized honey bees are an exotic species originally introduced in Brazil in 1956 (Whitfield *et al.* 2006, p. 644). They subsequently spread throughout South and Central America, displacing naturalized European honey bees, and arriving in Mexico, Guatemala, and Belize around 1986 (Whitfield *et al.* 2006, pp. 643-644; Clarke *et al.* 2002 and Rogel *et al.* 1991, in Berry *et al.* 2010, p. 486; Fierro *et al.* 1987, unpaginated). Africanized honeybees occur at higher densities and are more aggressive

than naturalized European honey bees (Rogel 1991 and Clarke *et al.* 2002, in Berry *et al.* 2010, p. 486). They attack and drive away intruders in the vicinity of their colonies, preventing the use of cavities in these areas by scarlet macaws. Africanized honeybees also take over occupied scarlet macaw nest cavities, killing the chicks or causing them to starve by driving off the nesting adults, resulting in failure of the macaw nest (Garcia *et al.* 2008, p. 52; Inigo-Elias 1996, p. 61). Inigo-Elias (1996, p. 61) reports that Africanized honey bees caused the failure of 3 of 41 nests during one breeding season. We are unaware of any other data or information on the effects of honeybees on scarlet macaw nesting. Although competition for nest sites with honeybees appears to be a threat to the species in the Maya Forest, we are unaware of any information indicating honeybees are a threat to the species throughout its range.

Climate Change

Our analyses under the Endangered Species Act include consideration of on-going and projected changes in climate. Described in general terms, “climate” refers to the mean and variability of different types of weather conditions over a long period of time, which may be reported as decades, centuries, or thousands of years. The term “climate change” thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature, precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (Intergovernmental Panel on Climate Change (IPCC) 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species, and these may be positive or negative depending on the species and other relevant considerations, such as the effects of interactions with non-climate conditions (e.g.,

habitat fragmentation). We use our expert judgment to weigh information, including uncertainty, in our consideration of various aspects of climate change that are relevant to the scarlet macaw.

Several studies project various changes in climate in Mesoamerica and the Amazon by the mid- to late century or sooner (Karmalkar *et al.* 2011, entire; Kitoh *et al.* 2011, entire; Giorgi and Bi 2009, entire; Anderson *et al.* 2008, entire; Cook and Vizzy 2008, entire; Li *et al.* 2008, entire; Christensen *et al.* 2007, pp. 892–896). Although there are uncertainties in these models, and variation in projections, the general trajectory under most scenarios is one of increased warming in Mesoamerica and the Amazon, and increased drying in Mesoamerica and some areas of the Amazon. Several studies (Imbach *et al.* 2011, abstract; Marengo *et al.* 2011, entire; Asner *et al.* 2010, entire; Vergara and Scholz 2010, entire; Malhi *et al.* 2009, entire; Malhi *et al.* 2008, entire; Nepstad *et al.* 2008, entire) project changes in habitat in areas of the species' range, either from climate change or from climate change in combination with deforestation. However, high levels of uncertainty remain in projecting habitat changes within the species' range (see review by Davidson *et al.* 2012, entire), and there is no consensus on the type or extent of habitat changes that will occur. In addition, the scarlet macaw has a high level of genetic diversity, and is tolerant of a relatively broad range of ecological conditions. The species occurs in a variety of habitat types including wet forest, dry forest, and savanna; has a broad and flexible diet; can nest in a variety of forest habitats provided they contain suitable nest cavities; and is known to inhabit patchworks of forest and human-modified landscapes and feed on introduced species (see **Biological Information**). Thus, the scarlet macaw is likely to be able to adapt to some level of change in its environment provided forest remains. Further, we are unaware of any information

indicating that the effects of climate change are now causing, or will in the future cause, declines in the scarlet macaw population.

Summary of Factor E

Although small population size combined with the cumulative effect of other threats, and competition for nest cavities, is a threat to the scarlet macaw in some areas of its range, we conclude that small population size, competition for nest cavities, and climate change are not impacting the scarlet macaw at a level that poses a threat to the species throughout its range. Further, we are not aware of any information indicating that any other factors not already discussed under Factors A, B, C, and D pose a threat to the species throughout all of its range.

In Mesoamerica, the scarlet macaw's current range is highly restricted and fragmented, populations are small and isolated, and threats continue to impact the species. Impacts of multiple threats typically operate synergistically, particularly when populations of a species are decreasing. Initial effects of one threat factor can later exacerbate the effects of other threat factors (Gilpin and Soulé 1986, pp. 25–26). Further fragmentation of populations can decrease the fitness and reproductive potential of the species, which will exacerbate other threats. Lack of a sufficient number of individuals in a local area or a decline in their individual or collective fitness may cause a decline in the population size, despite the presence of suitable habitat patches. Within the preceding review of the five factors, we have identified multiple threats that may have interrelated impacts on this species in Mesoamerica. For example, deforestation provides access to previously inaccessible areas, thereby opening up new areas of the species'

range to the threat of illegal poaching. Thus, the species' productivity in Mesoamerica may be reduced because of any of these threats, either singularly or in combination. The most significant threats in this region are habitat loss and poaching, particularly as populations in this region are small and fragmented, and the species requires a large range and variety of food sources. These threats occur at a scale sufficient to affect the status of the species in Mesoamerica both now and in the future. In addition, the species' current range in Mesoamerica is highly restricted and severely fragmented. The species' small population size, and its reproductive and life-history traits, combined with its highly restricted and severely fragmented range, increase the species' vulnerability to adverse natural events and human activities that eliminate habitat, reduce nesting success of breeding pairs, and remove individuals from these populations. The susceptibility to extirpation of limited-range species can occur for a variety of reasons, such as when a species' remaining population is so small or its distribution so fragmented that it may no longer be demographically or genetically viable (Harris and Pimm 2004, pp. 1612–1613). Although populations in this region have a high level of genetic diversity, they remain vulnerable to stochastic demographic and environmental events. Therefore, we find that the small sizes and isolated ranges of populations of the species in Mesoamerica, in combination with other threats identified above, are threats to the continued existence of the scarlet macaw throughout Mesoamerica, including the entire range of the subspecies *A. m. cyanoptera* and the range of *A. m. macao* in Costa Rica, Panama, and northwest Columbia, now and in the future.

Finding

Scarlet Macaw (A. macao) Finding

As required by the Act, we conducted a review of the status of the species and considered the five factors in assessing whether the scarlet macaw is endangered or threatened throughout all or a significant portion of its range. We examined the best scientific and commercial information available regarding the past, present, and future threats faced by the scarlet macaw. We reviewed the petition, information available in our files, and other available published and unpublished information.

In considering whether a species may warrant listing under any of the five factors, we look beyond the species' exposure to a potential threat or aggregation of threats under any of the factors, and evaluate whether the species responds to those potential threats in a way that causes an actual impact to the species. The identification of threats that might impact a species negatively may not be sufficient to compel a finding that the species warrants listing. The information must include evidence indicating that the threats are operative and, either singly or in aggregation, affect the status of the species. Threats are significant if they drive, or contribute to, the risk of extinction of the species, such that the species warrants listing as endangered or threatened, as those terms are defined in the Act.

The scarlet macaw has the broadest range of any macaw. Over 80 percent of the species' range occurs in the Amazon, and the scarlet macaw is considered widespread and relatively common in this region. Habitat destruction and modification as a result of deforestation and forest degradation occurs in the Amazon, but the majority of the area affected occurs in south and east Brazil, and projected forest loss in the Amazon still leaves large areas of intact forest

outside Brazil and in northwest Brazil by 2050. Poaching for the pet trade and hunting occur, but we have no information indicating that the magnitude of this threat places the species in danger of extinction throughout its range now or in the foreseeable future. In Peru, where poaching for the pet trade was initially believed to be a threat, it has been found in trade only in small numbers. Additionally, we are aware of no information indicating that disease, predation, inadequacy of existing regulatory mechanisms, other factors, or the cumulative impact of factors place the species in danger of extinction in the Amazon now or within the foreseeable future. According to BLI (2011a, unpaginated), the scarlet macaw is suspected of being in decline globally, and, as discussed in *Distribution and Abundance*, evidence indicates that scarlet macaw numbers and distribution have been much reduced over the past few decades in Mesoamerica. However, we found no evidence that the species is declining in the Amazon except around human population centers, and much of the species' range in the Amazon is remote from human populations. For these reasons, and because large areas of intact forest are projected to remain in the Amazon for the next few decades, it is reasonable to conclude that if the suspected population decline of scarlet macaws is occurring throughout its range, it is unlikely to be occurring at a rate that puts the species in danger of extinction now or in the foreseeable future.

Because the best available information indicates that the scarlet macaw in the majority of its range is not in danger of extinction (endangered), or likely to become so in the foreseeable future (threatened), we conclude that listing the species under the Act is not warranted at this time.

Having determined that listing the species throughout its range is not warranted, we next consider whether listing either subspecies, *Ara macao cyanoptera* or *Ara macao macao*, is warranted.

Northern Subspecies (A. m. cyanoptera) Finding

The northern subspecies of scarlet macaw, *A. m. cyanoptera*, inhabits the species' current range in Mexico, Guatemala, Belize, Honduras, and Nicaragua. This status review identified threats to *A. m. cyanoptera* attributable to Factors A, B, D, and E. The primary threats to this subspecies are habitat loss, illegal capture for the pet trade, the inadequacy of regulatory mechanisms that address these threats, and small population size combined with the cumulative effects of threats. Habitat destruction and modification (Factor A) in the form of deforestation and forest degradation are occurring throughout the subspecies' range. Illegal capture for the pet trade (Factor B) is also likely occurring throughout the subspecies' range, and is exacerbated by deforestation because deforestation increases access to the subspecies. Regulatory mechanisms (Factor D) are inadequate to prevent further loss of forest habitat and continued capture and trade of the species throughout the subspecies' range.

Although little quantitative data on historical populations are available, the range of this subspecies has been greatly reduced and fragmented over the past several decades. It is, therefore, clear that the global population of *A. m. cyanoptera* has experienced a large decline, primarily due to loss of habitat and capture for the pet trade. As a result, the current global population is estimated to be 4,000 or fewer individuals (see ***Distribution and Abundance***).

Section 3 of the Act defines an “endangered species” as “any species which is in danger of extinction throughout all or a significant portion of its range,” and a “threatened species” as “any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” Given (1) the large extent of the decline in the subspecies’ range and numbers in recent decades due to habitat destruction and modification and capture for the illegal pet trade, (2) that these threats are ongoing within the range of the subspecies, (3) that existing regulatory mechanisms addressing these threats are inadequate, and (4) we found no information indicating that these threats are being ameliorated, we find that these threats are immediate and significant and place the subspecies *A. m. cyanoptera* in danger of extinction at this time. Therefore, on the basis of the best scientific and commercial information available, we find that *A. m. cyanoptera* meets the definition of an “endangered” species under the Act, and we are proposing to list this subspecies as endangered throughout its range.

We have reviewed the available information to determine if the existing and foreseeable threats render the species at risk of extinction now such that issuing an emergency regulation temporarily listing the species in accordance with section 4(b)(7) of the Act is warranted. We have determined that issuing an emergency regulation temporarily listing *A. m. cyanoptera* is not warranted for this subspecies at this time because there are no impending actions that might result in extinction of the species that would be addressed and alleviated by emergency listing. However, if at any time we determine that issuing an emergency regulation temporarily listing *A. m. cyanoptera* is warranted, we will initiate this action at that time.

Southern Subspecies (*A. m. macao*) Finding

The southern subspecies of scarlet macaw, *A. m. macao*, inhabits the species' range from Costa Rica southward into South America. As with the species as a whole, the vast majority of the range of *A. m. macao* (greater than 80 percent) occurs in the Amazon. Therefore, for the reasons discussed under our finding for the species, *A. macao*, located above, we find that listing this subspecies throughout its range is not warranted.

Having determined that listing the whole subspecies of *A. m. macao* is not warranted, we now consider whether there are any distinct population segments (DPSes) of the subspecies that warrant listing under the Act.

Distinct Population Segments

Section 3(16) of the Act defines “species” to include “any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.” To interpret and implement the DPS provisions of the Act and Congressional guidance, the Service and National Marine Fisheries Service published a policy regarding the recognition of distinct vertebrate population segments in the **Federal Register** (DPS Policy) on February 7, 1996 (61 FR 4722). Under the DPS policy, three factors are considered in a decision concerning the establishment and classification of a possible DPS. These are applied similarly to endangered and threatened species. The first two factors—discreteness of the population segment in relation to the

remainder of the taxon and the significance of the population segment to the taxon to which it belongs—bear upon whether the population segment is a valid DPS. If a population meets both tests, it is a DPS, and then the third factor is applied—the population segment’s conservation status in relation to the Act’s standards for listing, delisting, or reclassification (*i.e.*, is the population segment endangered or threatened?).

Discreteness Analysis

Under the DPS policy, a population segment of a vertebrate taxon may be considered discrete if it satisfies either of the following conditions: (1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors (quantitative measures of genetic or morphological discontinuity may provide evidence of this separation); or (2) it is delimited by international boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

Genetic studies of scarlet macaws from throughout the species’ range show that *A. m. macao* north and west of the Andes mountains (those in Costa Rica, Panama, and northwest Columbia) are genetically different from those south and east of the Andes (northern South America), indicating birds in these two areas represent separate populations (Schmidt 2011, pers. comm.). The Andes reach over 5,700 m (18,701 ft) in elevation in Columbia, with few passes below 1,600 m (5,249 ft) (Parsons 1982, pp. 254–256), and the highest elevation at which scarlet

macaws have been recorded is approximately 1,500 m (4,921 ft). Thus, the Andes represent a major physical barrier separating these two populations. Therefore, we conclude that *A. m. macao* north and west of the Andes are markedly separated from *A. m. macao* south and east of the Andes and represent two discrete populations.

Significance Analysis

If a population segment is considered discrete under one or more of the conditions described in our DPS policy, its biological and ecological significance is to be considered in light of Congressional guidance that the authority to list DPSes be used “sparingly” while encouraging the conservation of genetic diversity. In carrying out this examination, we consider available scientific evidence of the population segment’s importance to the taxon to which it belongs. This consideration may include, but is not limited to: (1) Its persistence in an ecological setting unusual or unique for the taxon; (2) evidence that its loss would result in a significant gap in the range of the taxon; (3) evidence that it is the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; or (4) evidence that the DPS differs markedly from other populations of the species in its genetic characteristics. A population segment needs to satisfy only one of these criteria to be considered significant. Furthermore, the list of criteria is not exhaustive; other criteria may be used, as appropriate. Below, we consider the biological and ecological significance of the *A. m. macao* populations on either side of the Andes.

Evidence indicates that loss of either population of *A. m. macao* would result in a significant gap in the range of the subspecies. The subspecies' range south and east of the Andes comprises well over 90 percent of its entire range (considering that the Amazon comprises an estimated 83 percent of the entire range of the species), all of its range in the Amazon, and the vast majority of its range on the South American continent (all but northwest Columbia). Therefore, its loss would result in a significant gap in the range of the subspecies.

Although considerably smaller, the area of the subspecies' range north and west of the Andes inhabits a unique geographical position in the range of the subspecies. It is located partly on the Central American isthmus, a biological transition zone between the north and south American continents and a biodiversity "hotspot" (Muller and Patry 2011, p. 80; Myers *et al.* 2000, entire). This population occurs in the only area of the subspecies range located on the Central American isthmus, and the only area where the subspecies occurs on the Pacific slope of Central or South America. It is also the only area of the subspecies range with a connection to the range of *A. m. cyanoptera*. The population of *A. m. macao* north and west of the Andes includes, in northern Costa Rica (the transition zone also extends into southern Nicaragua) (Wiedenfeld 1994, pp. 100–101), and, together with genetic differences between the two populations of *A. m. macao*, indicates that a loss of the population north and west of the Andes would represent a significant loss to the genetic diversity of the subspecies. Loss of this population would also result in elimination of the subspecies from Central America and subsequent loss of the connection, and subsequently the transition zone, between populations of the two subspecies of scarlet macaw. Thus, we conclude that loss of the population of *A. m. macao* north and west of the Andes would result in a significant gap in the subspecies' range.

We conclude that loss of either population of *A. m. macao* (the population north and west of the Andes or the population south and east of the Andes) would create a significant gap in the range of the subspecies. Therefore, because we find these two population segments to be discrete and because they meet the significance criterion, with respect to evidence that loss of either population segment would result in a significant gap in the range of the taxon, both qualify as DPSes under the Act. For the remainder of this document, we refer to the DPS north and west of the Andes as the northern DPS of *A. m. macao*, and the DPS south and east of the Andes as the southern DPS of *A. m. macao*.

Finding for the Northern DPS of A. m. macao

We are unaware of any information on the numbers, if any, or status of *A. m. macao* in northwest Columbia. Therefore, we limit our discussion here to populations in Costa Rica and Panama, and request information from the public on the status of the subspecies in northwest Columbia (see **Information Requested**).

This status review identified threats to the scarlet macaw attributable to Factors A, B, D, and E, in Costa Rica and Panama. The primary threats to the northern DPS of *A. m. macao* are habitat loss, illegal capture for the pet trade, the inadequacy of regulatory mechanisms that address these threats, and small population size combined with the cumulative effects of threats. Habitat destruction and modification (Factor A) in the form of deforestation and forest degradation are likely occurring in the range of two of the three populations in this region (the

populations in southern Pacific Costa Rica and Panama). Illegal capture for the pet trade (Factor B) is also likely occurring in the range of all three populations in this region, and is exacerbated by deforestation because deforestation increases access to these birds. Regulatory mechanisms (Factor D) are inadequate to prevent further loss of forest habitat and continued capture and trade of the species throughout this region.

Although quantitative data on historical populations are not available, as discussed above, the range of *A. m. macao* north and west of the Andes has been greatly reduced and fragmented over the past several decades. The species has been almost completely eliminated from Panama, and has been eliminated from 80 percent of its range in Costa Rica, primarily due to loss of habitat and capture for the pet trade.

Section 3 of the Act defines an “endangered species” as “any species which is in danger of extinction throughout all or a significant portion of its range,” and a “threatened species” as “any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” Given (1) the large extent of the decline of the subspecies within the northern DPS of *A. m. macao* in recent decades due to habitat destruction and modification and capture for the illegal pet trade, (2) that these threats are ongoing within the range of this DPS, (3) that existing regulatory mechanisms addressing these threats are inadequate, and (4) we found no information indicating that these threats are being ameliorated, we find that these threats are immediate and significant and place the northern DPS of *A. m. macao* in danger of extinction at this time. Therefore, on the basis of the best scientific and commercial information available, we find that the northern DPS of *A. m. macao* meets the

definition of an “endangered species” under the Act, and we are proposing to list the northern DPS of *A. m. macao* as endangered throughout its range.

Finding for the Southern DPS of A. m. macao

This DPS of *A. m. macao* inhabits the vast majority of the subspecies range in South America. As with the species range, and subspecies range, the vast majority of the range of this DPS occurs in the Amazon. Therefore, for the reasons discussed under our finding for the species *A. macao* located above, we find that listing this DPS throughout its range is not warranted.

Having determined that listing the southern DPS of *A. m. macao* is not warranted, we next look at whether the southern DPS may be endangered or threatened with extinction in a significant portion of its range.

Significant Portion of the Range

Having determined that the southern DPS of *A. m. macao* is not endangered or threatened throughout its range, we must next consider whether there are any significant portions of the DPS where *A. m. macao* is in danger of extinction or is likely to become endangered in the foreseeable future.

The Act defines “endangered species” as any species which is “in danger of extinction throughout all or a significant portion of its range,” and “threatened species” as any species which is “likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” The definition of “species” is also relevant to this discussion. Section 3(16) of the Act defines “species” as follows: “The term ‘species’ includes any subspecies of fish or wildlife or plants, and any distinct population segment [DPS] of any species of vertebrate fish or wildlife which interbreeds when mature.” The phrase “significant portion of its range” (SPR) is not defined by the statute, nor addressed in our regulations. For example, neither the statute nor its implementing regulations describes the consequences of a determination that a species is either endangered or likely to become so throughout a significant portion of its range, but not throughout all of its range, or explains what qualifies a portion of a range as “significant.”

Two recent district court decisions have addressed whether the SPR language allows the Service to list or protect less than all members of a defined “species”: *Defenders of Wildlife v. Salazar*, 729 F. Supp. 2d 1207 (D. Mont. 2010), concerning the Service’s delisting of the Northern Rocky Mountain gray wolf (74 FR 15123, April 2, 2009); and *WildEarth Guardians v. Salazar*, 2010 U.S. Dist. LEXIS 105253 (D. Ariz. Sept. 30, 2010), concerning the Service’s 2008 finding on a petition to list the Gunnison’s prairie dog (73 FR 6660, February 5, 2008). The Service had asserted in both of these determinations that it had authority, in effect, to protect only some members of a “species,” as defined by the Act (i.e., species, subspecies, or DPS), under the Act. Both courts ruled that the determinations were arbitrary and capricious on the grounds that this approach violated the plain and unambiguous language of the Act. The courts

concluded that reading the SPR language to allow protecting only a portion of a species' range is inconsistent with the Act's definition of "species." The courts concluded that once a determination is made that a species (i.e., species, subspecies, or DPS) meets the definition of "endangered species" or "threatened species," it must be placed on the list in its entirety and the Act's protections applied consistently to all members of that species (subject to modification of protections through special rules under sections 4(d) and 10(j) of the Act).

Consistent with that interpretation, and for the purposes of this finding, we interpret the phrase "significant portion of its range" in the Act's definitions of "endangered species" and "threatened species" to provide an independent basis for listing; thus there are two situations (or factual bases) under which a species would qualify for listing: a species may be endangered or threatened throughout all of its range; or a species may be endangered or threatened in only a significant portion of its range. If a species is in danger of extinction throughout an SPR, it, the species, is an "endangered species." The same analysis applies to "threatened species." Based on this interpretation and supported by existing case law, the consequence of finding that a species is endangered or threatened in only a significant portion of its range is that the entire species will be listed as endangered or threatened, respectively, and the Act's protections will be applied across the species' entire range.

We conclude, for the purposes of this finding, that interpreting the SPR phrase as providing an independent basis for listing is the best interpretation of the Act because it is consistent with the purposes and the plain meaning of the key definitions of the Act; it does not conflict with established past agency practice (i.e., prior to the 2007 Solicitor's Opinion), as no

consistent, long-term agency practice has been established; and it is consistent with the judicial opinions that have most closely examined this issue. Having concluded that the phrase “significant portion of its range” provides an independent basis for listing and protecting the entire species, we next turn to the meaning of “significant” to determine the threshold for when such an independent basis for listing exists.

Although there are potentially many ways to determine whether a portion of a species’ range is “significant,” we conclude, for the purposes of this finding, that the significance of the portion of the range should be determined based on its biological contribution to the conservation of the species. For this reason, we describe the threshold for “significant” in terms of an increase in the risk of extinction for the species. We conclude that a biologically based definition of “significant” best conforms to the purposes of the Act, is consistent with judicial interpretations, and best ensures species’ conservation. Thus, for the purposes of this finding, and as explained further below, a portion of the range of a species is “significant” if its contribution to the viability of the species is so important that without that portion, the species would be in danger of extinction.

We evaluate biological significance based on the principles of conservation biology using the concepts of redundancy, resiliency, and representation. *Resiliency* describes the characteristics of a species and its habitat that allow it to recover from periodic disturbance. *Redundancy* (having multiple populations distributed across the landscape) may be needed to provide a margin of safety for the species to withstand catastrophic events. *Representation* (the range of variation found in a species) ensures that the species’ adaptive capabilities are

conserved. Redundancy, resiliency, and representation are not independent of each other, and some characteristic of a species or area may contribute to all three. For example, distribution across a wide variety of habitat types is an indicator of representation, but it may also indicate a broad geographic distribution contributing to redundancy (decreasing the chance that any one event affects the entire species), and the likelihood that some habitat types are less susceptible to certain threats, contributing to resiliency (the ability of the species to recover from disturbance). None of these concepts is intended to be mutually exclusive, and a portion of a species' range may be determined to be "significant" due to its contributions under any one or more of these concepts.

For the purposes of this finding, we determine if a portion's biological contribution is so important that the portion qualifies as "significant" by asking whether *without that portion*, the representation, redundancy, or resiliency of the species would be so impaired that the species would have an increased vulnerability to threats to the point that the overall species would be in danger of extinction (i.e., would be "endangered"). Conversely, we would not consider the portion of the range at issue to be "significant" if there is sufficient resiliency, redundancy, and representation elsewhere in the species' range that the species would not be in danger of extinction throughout its range if the population in that portion of the range in question became extirpated (extinct locally).

We recognize that this definition of "significant" (a portion of the range of a species is "significant" if its contribution to the viability of the species is so important that without that portion, the species would be in danger of extinction) establishes a threshold that is relatively

high. On the one hand, given that the consequences of finding a species to be endangered or threatened in an SPR would be listing the species throughout its entire range, it is important to use a threshold for “significant” that is robust. It would not be meaningful or appropriate to establish a very low threshold whereby a portion of the range can be considered “significant” even if only a negligible increase in extinction risk would result from its loss. Because nearly any portion of a species’ range can be said to contribute some increment to a species’ viability, use of such a low threshold would require us to impose restrictions and expend conservation resources disproportionately to conservation benefit: listing would be range-wide, even if only a portion of the range of minor conservation importance to the species is imperiled. On the other hand, it would be inappropriate to establish a threshold for “significant” that is too high. This would be the case if the standard were, for example, that a portion of the range can be considered “significant” only if threats in that portion result in the entire species’ being currently endangered or threatened. Such a high bar would not give the SPR phrase independent meaning, as the Ninth Circuit held in *Defenders of Wildlife v. Norton*, 258 F.3d 1136 (9th Cir. 2001).

The definition of “significant” used in this finding carefully balances these concerns. By setting a relatively high threshold, we minimize the degree to which restrictions will be imposed or resources expended that do not contribute substantially to species conservation. However, we have not set the threshold so high that the phrase “in a significant portion of its range” loses independent meaning. Specifically, we have not set the threshold as high as it was under the interpretation presented by the Service in the *Defenders* litigation. Under that interpretation, the portion of the range would have to be so important that current imperilment there would mean that the species would be *currently* imperiled everywhere. Under the definition of “significant”

used in this finding, the portion of the range need not rise to such an exceptionally high level of biological significance. (We recognize that if the species is imperiled in a portion that rises to that level of biological significance, then we should conclude that the species is in fact imperiled throughout all of its range, and that we would not need to rely on the SPR language for such a listing.) Rather, under this interpretation we ask whether the species would be endangered everywhere without that portion, *i.e.*, if that portion were completely extirpated. In other words, the portion of the range need not be so important that even the species being in danger of extinction in that portion would be sufficient to cause the species in the remainder of the range to be endangered; rather, the *complete extirpation* (in a hypothetical future) of the species in that portion would be required to cause the species in the remainder of the range to be endangered.

The range of a species can theoretically be divided into portions in an infinite number of ways. However, there is no purpose to analyzing portions of the range that have no reasonable potential to be significant or to analyzing portions of the range in which there is no reasonable potential for the species to be endangered or threatened. To identify only those portions that warrant further consideration, we determine whether there is substantial information indicating that: (1) The portions may be “significant,” *and* (2) the species may be in danger of extinction there or likely to become so within the foreseeable future. Depending on the biology of the species, its range, and the threats it faces, it might be more efficient for us to address the significance question first or the status question first. Thus, if we determine that a portion of the range is not “significant,” we do not need to determine whether the species is endangered or threatened there; if we determine that the species is not endangered or threatened in a portion of its range, we do not need to determine if that portion is “significant.” In practice, a key part of

the determination that a species is in danger of extinction in a significant portion of its range is whether the threats are geographically concentrated in some way. If the threats to the species are essentially uniform throughout its range, no portion is likely to warrant further consideration. Moreover, if any concentration of threats to the species occurs only in portions of the species' range that clearly would not meet the biologically based definition of "significant," such portions will not warrant further consideration.

SPR Analysis for the Southern DPS of A. m. macao

After reviewing the potential threats throughout the range of the southern DPS of *A. m. macao*, we determine that two areas, the area referred to as the arc of deforestation in the southern and eastern Amazon (in the Brazilian states of Para, Mato Grosso, Rondonia, and Acre) and the Brazilian state of Roraima, have concentrated threats (see discussion under **Factor A**), as 90 percent of deforestation in the Amazon occurs in these areas (INPE 2005, in Asner *et al.* 2005, p. 480). We next consider the contribution of these two portions to determine if these areas are significant, as described above.

As discussed under Factor A, above, the Amazon covers approximately 6.7 million km² (2.6 million mi²) in 9 countries and 1 territory of France. Even with the loss of either or both portions discussed above, large tracts of the DPS would remain, including large tracts of remote forest in northwest Brazil, Suriname, Guyana, French Guiana, eastern Peru, and southeast Columbia. Thus, even without either or both portions of the range identified above, large areas of the range of the southern DPS of *A. m. macao* would remain. As discussed above, *A. m.*

macao in the Amazon are reported to be common, widely distributed, genetically similar, and have high genetic variability. Thus, it is reasonable to conclude that *A. m. macao* in the remaining forest outside the identified portions would be common, widely distributed, and have high genetic variability. Further, although little information exists on movements of scarlet macaws in the Amazon, scarlet macaws are not migratory, and although they are nomadic to some degree, we know of no information suggesting that the two portions discussed above are required for the survival of the portion of the southern DPS of *A. m. macao* that occurs outside the two portions discussed above. Therefore, because (1) the remaining portion includes large areas of intact forest in several areas of the Amazon, (2) scarlet macaws in these remaining areas have high genetic diversity and are likely common and widely distributed, and (3) scarlet macaws are not migratory and thus the survival of scarlet macaws outside the two identified portions are unlikely to depend on the existence of the two identified portions, we conclude that remaining portion of the southern DPS of *A. m. macao* is likely to offer sufficient resiliency, redundancy, and representation to the DPS such that the DPS would not be in danger of extinction if the two portions identified above were completely lost.

In summary, despite having some locations of elevated risk to potential threats, we conclude that the portions of the southern DPS of *A. m. macao*'s range where these threats occur are not significant portions of its range. Even if scarlet macaws in these locations were extirpated at some time in the future, the DPS would persist at locations not affected by these threats. The existing, remaining population would be distributed across a large region of the Amazon in Suriname, Guyana, French Guayana, northwest Brazil, southeast Columbia, eastern Ecuador, and eastern Peru, and would provide adequate redundancy, resiliency, and

representation to the DPS. Therefore, the two identified portions (whether considered separately or combined) are not a “significant” portion of the species’ range because their contribution to the viability of the species is not so important that the species would be in danger of extinction without those portions.

We find that the southern DPS of *A. m. macao* is not in danger of extinction now, nor is it likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Therefore, listing the southern DPS of *A. m. macao* as endangered or threatened under the Act is not warranted at this time. We find that the southern DPS of *A. m. macao* is not in danger of extinction now, nor is it likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Therefore, listing the southern DPS of *A. m. macao* as endangered or threatened under the Act is not warranted at this time. However, for law enforcement purposes, we are considering listing this DPS, and intraspecific crosses of scarlet macaws, based on similarity of appearance to entities proposed for listing in this document, and request information from the public pertaining to this subject (see Information Requested).

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Act include recognition, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness, and encourages and results in conservation actions by Federal and State governments, private agencies and interest groups, and individuals.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered and threatened wildlife. These prohibitions, at 50 CFR 17.21 and 17.31, in part, make it illegal for any person subject to the jurisdiction of the United States to “take” (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or to attempt any of these) within the United States or upon the high seas; import or export; deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of commercial activity; or sell or offer for sale in interstate or foreign commerce any endangered wildlife species. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken in violation of the Act. Certain exceptions apply to agents of the Service and State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22 for endangered species and 17.32 for threatened species. With regard to endangered wildlife, a permit may be issued for the following purposes: for scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities. For threatened species, a permit may be issued for the same activities, as well as zoological exhibition, education, and special purposes consistent with the Act.

Peer Review

In accordance with our policy, “Notice of Interagency Cooperative Policy for Peer Review in Endangered Species Act Activities,” that was published on July 1, 1994 (59 FR 34270), we will seek the expert opinion of at least three appropriate independent specialists regarding this proposed rule. The purpose of such review is to ensure listing decisions are based on scientifically sound data, assumptions, and analysis. We will send copies of this proposed rule to the peer reviewers immediately following publication in the **Federal Register**. We will invite these peer reviewers to comment, during the public comment period, on the specific assumptions and the data that are the basis for our conclusions regarding this proposal to list as endangered the northern scarlet macaw subspecies (*Ara macao cyanoptera*) and the northern DPS of the southern scarlet macaw subspecies (*Ara macao macao*), under the Act.

We will consider all comments and information we receive during the comment period on this proposed rule during preparation of a final rulemaking. Accordingly, our final decision may differ from this proposal.

Required Determinations

Clarity of Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

- (a) Be logically organized;

- (b) Use the active voice to address readers directly;
- (c) Use clear language rather than jargon;
- (d) Be divided into short sections and sentences; and
- (e) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in the **ADDRESSES** section. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the names of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have determined that we do not need to prepare an environmental assessment, as defined under the authority of the National Environmental Policy Act of 1969, in connection with regulations adopted under section 4(a) of the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

References Cited

A list of all references cited in this document is available at <http://www.regulations.gov>, Docket No. **FWS-R9-ES-2012-0039**, or upon request from the U.S. Fish and Wildlife Service,

Endangered Species Program, Branch of Foreign Species (see **FOR FURTHER INFORMATION CONTACT** section).

Authors

The primary authors of this notice are staff members of the Branch of Foreign Species, Endangered Species Program, U.S. Fish and Wildlife Service.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361-1407; 16 U.S.C. 1531-1544; 16 U.S.C. 4201-4245; Pub. L. 99-625, 100 Stat. 3500; unless otherwise noted.

2. Amend § 17.11(h) by adding new entries for “Macaw, scarlet” in alphabetical order under **BIRDS** to the List of Endangered and Threatened Wildlife, to read as follows:

§17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic Range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
*	*	*	*	*	*	*	
BIRDS							
*	*	*	*	*	*	*	
Macaw, scarlet	<i>Ara macao cyanoptera</i>	Mexico, Guatemala, Belize, El Salvador, Honduras, Nicaragua	Entire	E		NA	NA
Macaw,	<i>Ara macao</i>	Costa Rica,	Costa Rica, Panama, and the	E		NA	NA

scarlet	<i>macao</i>	Panama, Colombia, Ecuador, Peru, Suriname, Guyana, French Guiana, Brazil, Bolivia	portion of Colombia north and west of the Andes				
*	*	*	*	*	*	*	

* * * * *

Dated: June 26, 2012

/s/ Gregory Siekaniec

Acting Director, U.S. Fish and Wildlife Service

Billing Code 4310-55

[FR Doc. 2012-16445 Filed 07/05/2012 at 8:45 am; Publication Date: 07/06/2012]